# EMC Test Report

**Project Number:** 2733706

**Report Number:** 2733706EMC02 **Revision Level:** 1

**Client:** Sonim Technologies Inc.

**Equipment Under Test:** Cellular/PCS CDMA/EvDO Phone with Bluetooth

**Marketing Name:** Sonim XP Strike

**Model:** Sonim XP3410-A-R1 (C21F010AA)

**FCC Rule Parts:** Part 2, Part 90S

**Report issued on:** 27 September 2012

**Test Result:** Compliant

Tested by: Fabian Nica, Engineering Technician

Reviewed by: David Schramm, EMC Manager

Remarks:
This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

# Table of Contents

# 1 Summary of Test Results

| FCC Part Sections | Test Description | Test Limit | Test Condition | Test Result |
|---|---|---|---|---|
| **Transmit Mode Testing** | | | | |
| 2.1046 | Conducted Output Power | N/A | Conducted | Pass |
| 2.1049 | Occupied Bandwidth | N/A | | Pass |
| 2.1051<br>90. 691 | Band Edge / Conducted Spurious Emissions | < 43 +10log$_{10}$ ($P_{[Watts]}$) at band edge and for all out of band emissions | | Pass |
| 90.635 | Effective Radiated Power | < 100 Watts max ERP | Radiated | Pass |
| 2.1053<br>90.669 | Radiated Spurious Emissions | < 43 +10log$_{10}$ ($P_{[Watts]}$) at band edge and for all out of band emissions | | Pass |
| 2.1055<br>90.213 | Frequency Stability | <2.5 ppm | | Pass |

## 1.1 *Modifications Required to Compliance*

None

# 2 General Information

## 2.1 *Client Information*

| | |
|---|---|
| Name: | Sonim Technologies, Inc. |
| Address: | 1825 S. Grant St., Suite 200 |
| City, State, Zip, Country: | San Mateo, CA 94402, USA |

## 2.2 *Test Laboratory*

| | |
|---|---|
| Name: | SGS North America, Inc. |
| Address: | 620 Old Peachtree Road NW, Suite 100 |
| City, State, Zip, Country: | Suwanee, GA 30024, USA |

## 2.3 *General Information of EUT*

| | |
|---|---|
| Marketing Name: | Sonim XP Strike |
| Model: | Sonim XP3410-A-R1 (C21F010AA) |
| Serial Number: | A1000012926883, A1000012926880 |
| Hardware Version: | B2.5 |
| Firmware Version: | XP3410_0200B00_0150T |
| Rated Voltage: | 3.8 Vdc, internal battery |
| Test Voltage: | Fully charged 3.7 Vdc, internal battery |
| Tx Frequency Range: | 817.9 - 823. 1 MHz (BC10, CDMA) |
| Maximum Output Power: | 0.275 W (24.4 dBm) ERP (BC0, CDMA) |
| Power Class: | III |
| Emissions Designator: | 1M28F9W (BC10, CDMA) |
| Sample Received Date: | July 20, 2012 |
| Dates of testing: | July 20 to September 25, 2012 |

## 2.4 *Operating Modes and Conditions*

The EUT was programmed by the manufacturer to run continuously exercising all modes of operation.

# 3 US Cellular SMR Band (BC10)

## 3.1 *RF Output Power*

### 3.1.1 Test Result

| Test Description | Basic Standards | Test Result |
|---|---|---|
| RF Output Power | FCC Part 2.1046 | Reported |

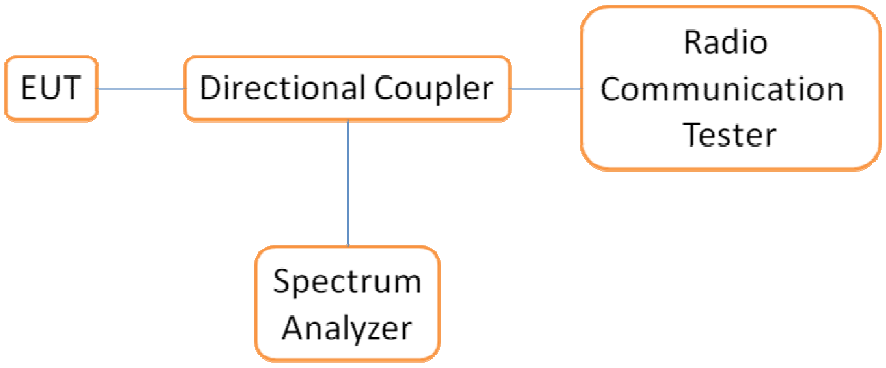
### 3.1.2 Test Method

A radio link was established between EUT and Radio Communication Tester. The output power of the EUT was set to maximum value by using the maximum power setting on the Radio Communications Tester. The output power was measured by a spectrum analyzer with the use of a directional coupler.

The power was measured using an RMS detector in accordance with KDB 971168.

Measured modes for CDMA: RC1/SO2, RC1/SO55, RC3/SO2, RC3/SO9, RC3/SO55
Measured modes for EvDO Rev 0: RTAP xx.x k, where xx.x ranges from 9.6 to 153.6.
Measured modes for EvDO Rev A: RETAP xx.x k, where xx.x ranges from 128 to 12288

For CDMA Band 10, the measurement will be conducted at two channels: 476 and 684 (low and high channels of US Cellular SMR Band).




### 3.1.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

| | |
|---|---|
| Temperature: | 25.6 ℃ |
| Relative Humidity: | 55.2 % |
| Atmospheric Pressure: | 97.6 kPa |

### 3.1.4 Test Equipment

| Equipment | Model | Manufacturer | Asset Number | Cal Due Date |
|---|---|---|---|---|
| Receiver | ESU40 | R & S | B079629 | 25 Aug 2012 |
| Radio Communications Tester | CMW-500 | R & S | B085757 | 28 Sep 2012 |
| Directional Coupler | 778D | Agilent / HP | B087456 | 14 Oct 2012 |
| Coaxial Cable | Sucoflex 106 | Huber+Suhner | B079656 | 12 Aug 2012 |

Note: The calibration period equipment is 1 year.

### 3.1.5 Test Data

| Center Frequency MHz | Channel No. | Test Mode | RF Power Output dBm (Average) |
|---|---|---|---|
| 817.9 | 476 | RC1 / SO2 | 24.7 |
| | | RC1 / SO55 | 24.9 |
| | | RC3 / SO2 | 24.8 |
| | | RC2 / SO9 | 24.8 |
| | | RC4 / SO9 | 24.9 |
| | | RC3 / SO55 | 25.0 |
| | | RTAP 9.6k | 25.0 |
| | | RTAP 38.4k | 25.0 |
| | | RTAP 153.6k | 25.0 |
| | | RETAP 128 | 24.6 |
| | | RETAP 2048 | 24.9 |
| | | RETAP 4096 | 25.0 |
| | | RETAP 12288 | 25.1 |
| 823.1 | 684 | RC1 / SO2 | 24.7 |
| | | RC1 / SO55 | 24.9 |
| | | RC3 / SO2 | 24.8 |
| | | RC2 / SO9 | 24.8 |
| | | RC4 / SO9 | 24.8 |
| | | RC3 / SO55 | 24.9 |
| | | RTAP 9.6k | 25.0 |
| | | RTAP 38.4k | 25.0 |
| | | RTAP 153.6k | 25.0 |
| | | RETAP 128 | 25.0 |
| | | RETAP 2048 | 25.0 |
| | | RETAP 4096 | 25.1 |
| | | RETAP 12288 | 25.1 |

## 3.2 *Occupied Bandwidth*

### 3.2.1 Test Result

| Test Description | Basic Standards | Test Result |
|---|---|---|
| Occupied Bandwidth | FCC Part 2.1049 | Reported |

### 3.2.2 Test Method

**Occupied bandwidth – power bandwidth (99%) measurement procedure**[1]
The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 % of the total mean power of the given emission.

The following procedure shall be used for measuring (99 %) power bandwidth[2]

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts.
b) The nominal IF filter bandwidth (3 dB RBW) shall be set to approximately 1% of the span, without being below 1%, and VBW should be approximately 3 × RBW or greater.
*c)* Set the reference level of the instrument as required keeping the signal from exceeding the maximum spectrum analyzer input mixer level for linear operation. In general, the peak of the spectral envelope must be more than 10 log (OBW / RBW) below the reference level.

*Steps a) through c) may require iteration to adjust within the specified range.*

d) Video averaging is not permitted. For analog or narrowband digital modulation the detector shall be set to peak, trace mode set to max-hold. For digital wideband modulation (OBW > 1MHz) the detector shall be set to average power (RMS) detector, trace mode set to clear-write and a single sweep.
e) Use the 99 % power bandwidth function of the spectrum analyzer (if available) and report the measured bandwidth.
f) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display. The axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

A radio link was established between EUT and Radio Communications Tester. The output power of the EUT was set to maximum value by using the maximum power setting on the Radio Communications Tester. The occupied bandwidth is measured using spectrum analyzer's occupied bandwidth measurement.

The bandwidth of 99% power can be read on spectrum analyzer.

The measurement was conducted at two channels: 476 and 684 (low and high channels) in RETAP 12288K test mode.

[1] Measurement method to satisfy FCC CFR Title 47 §2.1049 and IC RSS-Gen
[2] See FCC KDB 971168 D01 Power Measurement – License Digital Systems v01

### 3.2.3 Test Site

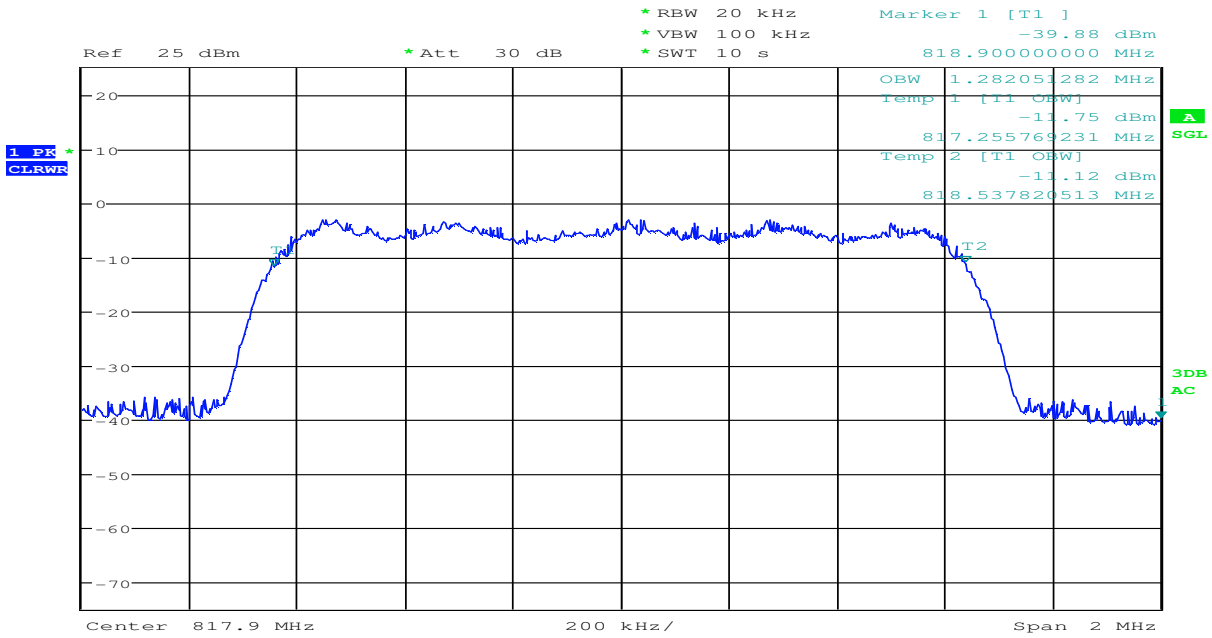
SGS EMC Laboratory, Suwanee, GA

### 3.2.4 Test Equipment

| Equipment | Model | Manufacturer | Asset Number | Cal Due Date |
|---|---|---|---|---|
| Receiver | ESU8 | R & S | B085759 | 12 Jun 2012 |
| Radio Communications Tester | CMW-500 | R & S | B085757 | 28 Sep 2012 |
| Directional Coupler | 778D | Agilent / HP | B087456 | 14 Oct 2012 |
| Coaxial Cable | Sucoflex 106 | Huber+Suhner | B079656 | 12 Aug 2012 |

Note: The calibration period equipment is 1 year.

### 3.2.5 **Test Data**

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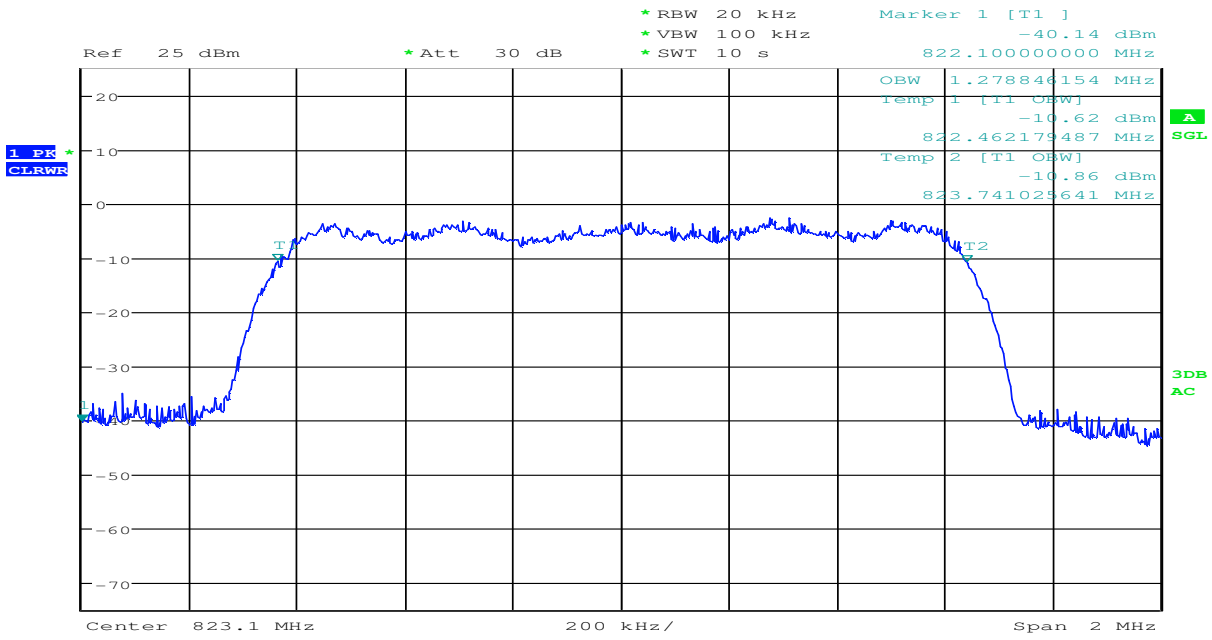



Date: 25.SEP.2012 19:58:54

## 3.3 *Conducted Spurious Emissions*

### 3.3.1 Test Result

| Test Description | Basic Standards | Test Result |
|---|---|---|
| Conducted spurious emissions and Band Edge | FCC Part 2.1051<br>FCC Part 90.691 | Pass |

### 3.3.2 Test Method

The levels of the carrier and the various conducted spurious and harmonics frequencies are measured by means of a calibrated spectrum analyzer. The emissions spectrum emanating from the EUT transmit antenna port is scanned from the lowest frequency generated in the equipment up to a frequency including its $10^{th}$ harmonic.

On any frequency outside the EA licensee's frequency block 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.

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) 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..

Compliance is based on the use of a spectrum analyzer employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of a least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. KDB 971168 D01 Power Measurement – License Digital Systems v01 allows the use of the 99% bandwidth to be used as the emission bandwidth.

Scans from 30 MHz to 10 GHz were made using a resolution bandwidth of 1 MHz and a video bandwidth equal to or greater than 1 MHz.

The measurement was conducted at the middle channel in RETAP 12288K test mode as pre-scans showed this to yield the worst case test results.

### 3.3.3 Test Site

SGS EMC Laboratory, Suwanee, GA

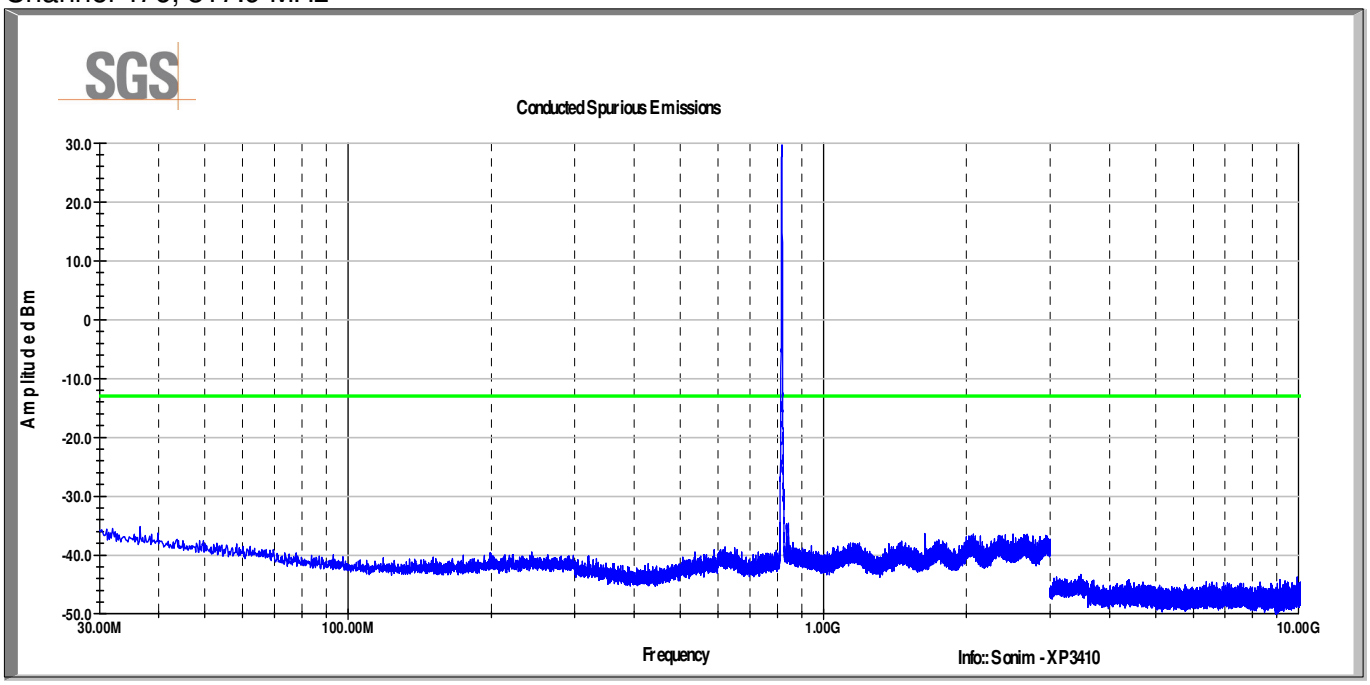
### 3.3.4 Test Equipment

| Equipment | Model | Manufacturer | Asset Number | Cal Due Date |
|---|---|---|---|---|
| Receiver | ESU40 | R & S | B079629 | 25 Aug 2012 |
| Radio Communications Tester | CMW-500 | R & S | B085757 | 28 Sep 2012 |
| Directional Coupler | 11692D | Agilent / HP | B079666 | 14 OCT 2012 |
| Directional Coupler | 778D | Agilent / HP | B087456 | 14 Oct 2012 |
| Coaxial Cable | Sucoflex 106 | Huber+Suhner | B079656 | 12 Aug 2012 |
| High Pass Filter | HPM50110 | Microtronics | B003146 | 6 Aug 2013 |

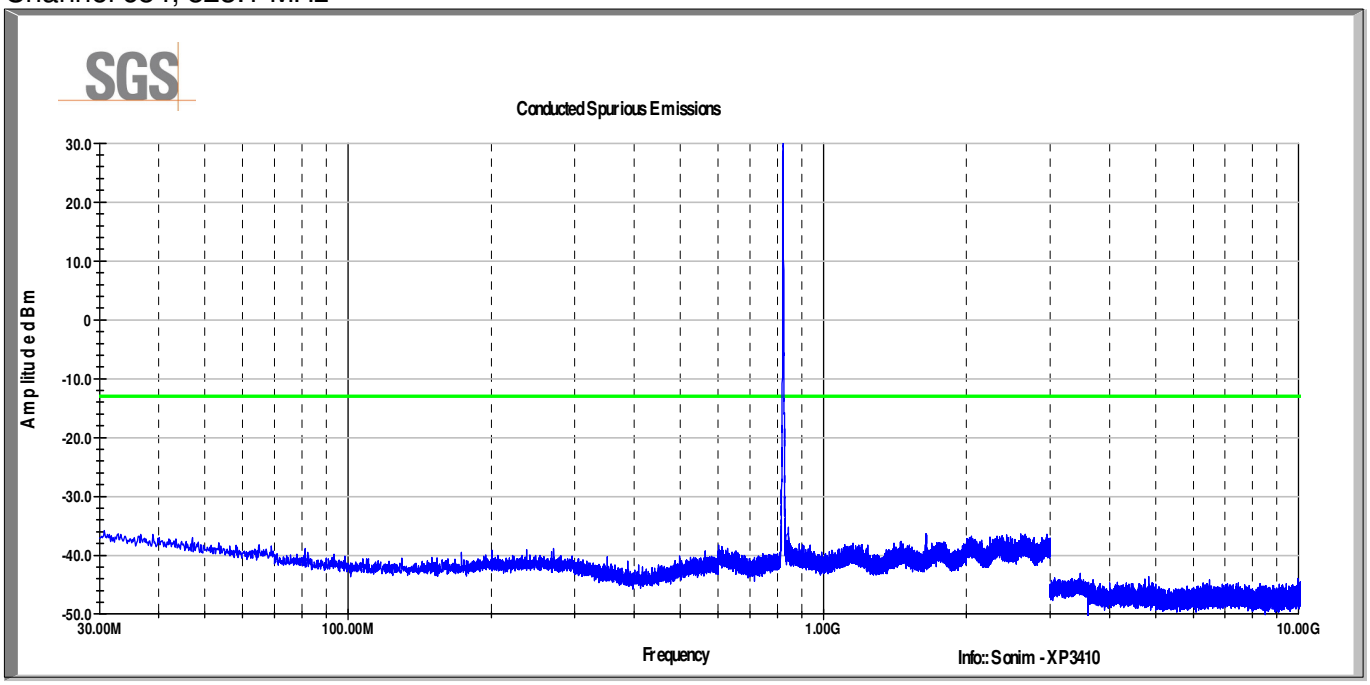
Note: The calibration period equipment is 1 year.

### 3.3.5 **Test Data**

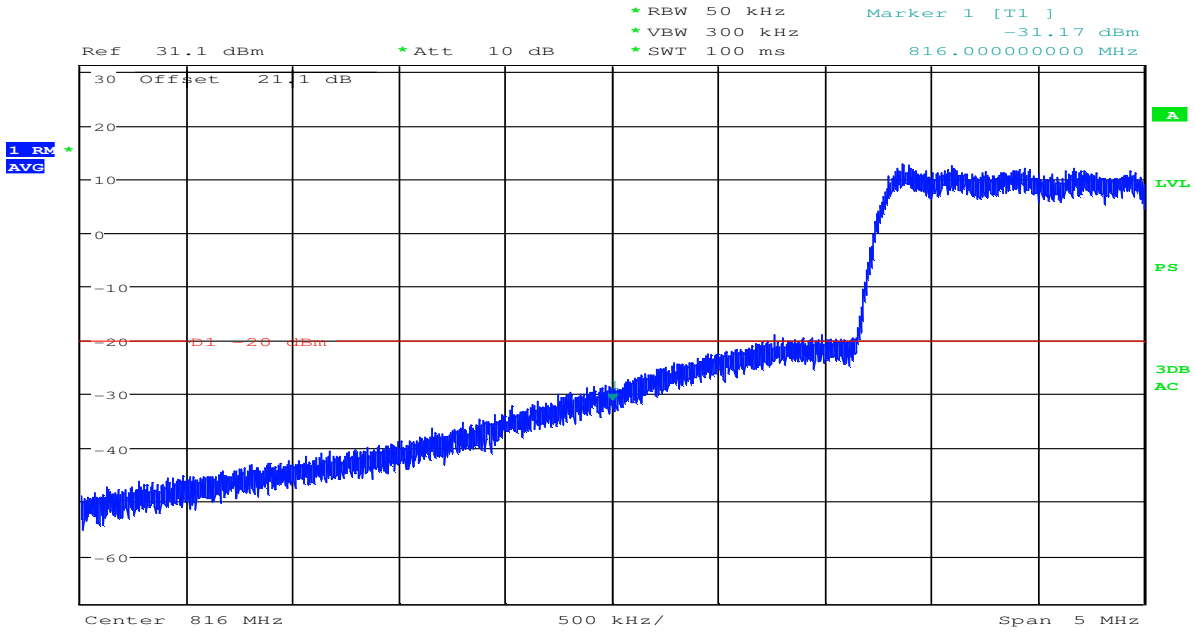
Test Date: 2 Aug 2012
Channel 476, 817.9 MHz




Channel 684, 823.1 MHz

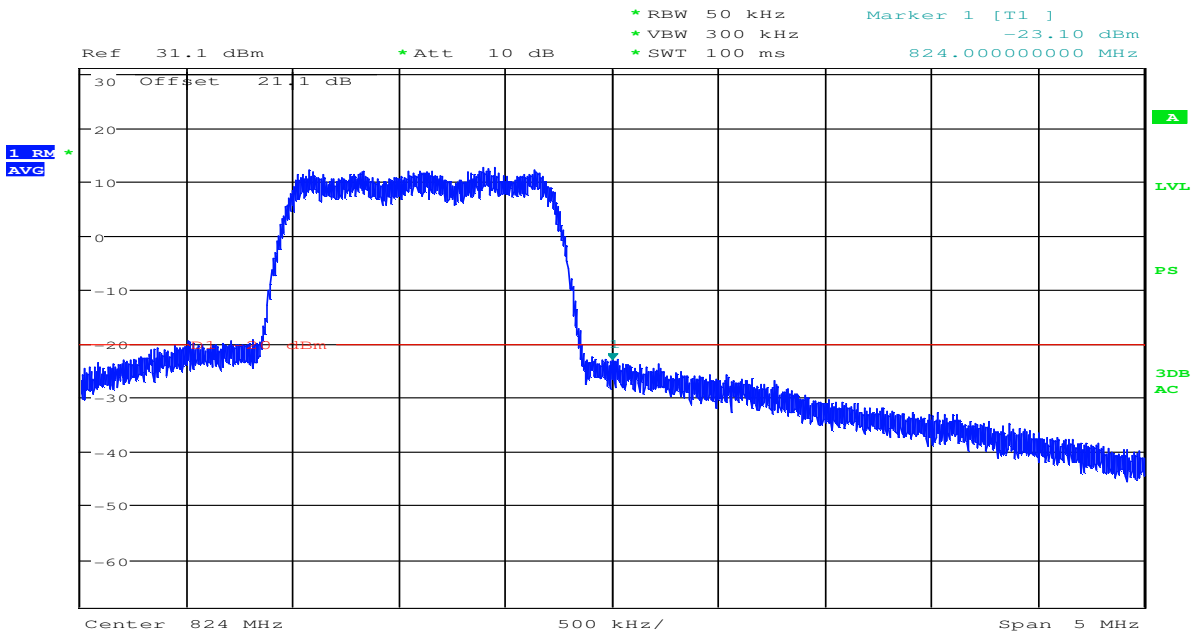


## Lower Band Edge




Date: 9.AUG.2012 16:49:11

## Upper Band Edge




Date: 9.AUG.2012 16:52:29

Note: The reference level offset was calculated by summing the insertion losses of the directional coupler and cable used during this measurement.

## 3.4 *Effective Radiated Power*

### 3.4.1 Test Result

| Test Description | Basic Standards | Test Result |
|---|---|---|
| Effective Radiated Power | FCC Part 90.635 | Pass |

### 3.4.2 Test Method

The measurements above 1 GHz are carried out in a fully anechoic chamber. Below 1 GHz, the measurements are carried out in semi-anechoic chamber. The EUT was placed on a 0.8 meter high non-conductive table at a 3 meters test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. The height of receiving antenna is varied from 1 to 4 m to find the maximum power value. A radio link was established between EUT and Radio Communications Tester. The output power of the EUT was set to maximum value by using the maximum power setting on the Radio Communications Tester. A RMS detector is used and RBW is set to 3MHz. Then the antenna height and turn table rotation is adjusted till the maximum power value is founded on spectrum analyzer.

The EUT was positioned through each of its three orthogonal axes and the highest level was reported.

A dipole antenna (below 1 GHz) or double-ridged waveguide antenna (above 1 GHz) was substituted in place of the EUT. The substitution antenna will be driven by a signal generator. The receive antenna is varied to find the maximum response to the spectrum analyzer. Then the level of signal generator will be adjusted to achieve the same power value on the spectrum analyzer or receiver.

The ERP/EIRP of the EUT can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

The measurement was conducted at two channels: 476 and 684 (low and high channels) in RETAP 12288K test mode as pre-scans showed this to yield the worst case test results.

### 3.4.3 Test Site

10m Semi-anechoic chamber, SGS EMC Laboratory, Suwanee, GA

### 3.4.4 Test Equipment

| Equipment | Model | Manufacturer | Asset Number | Cal Due Date |
|---|---|---|---|---|
| Bilog Antenna | JB6 | Sunol | B079690 | 24 Aug 2012 |
| DRWG Antenna | 3117 | ETS-Lindgren | B079691 | 31 May 2013 |
| DRWG Antenna | 3117 | ETS-Lindgren | B079699 | 21 May 2013 |
| Receiver | ESU40 | R&S | B079629 | 25 Aug 2012 |
| Coaxial Cable | Sucoflex 106 | Huber+Suhner | B079712 | 12 Aug 2012 |
| Coaxial Cable | Sucoflex 106 | Huber+Suhner | B079711 | 12 Aug 2012 |
| Coaxial Cable | Sucoflex 106 | Huber+Suhner | B085888 | 26 Sep 2012 |
| Radio Communications Tester | CMW-500 | R&S | B085757 | 28 Sep 2012 |
| Dipole Antenna | 3121D-DB4 | ETS-Lindgren | B085753 | 16 Mar 2012 |
| Signal Generator | HMC-T2240 | Hittite | B001212 | CNR |

Note: The calibration period equipment is 1 year.

### 3.4.5 Test Data

| Frequency MHz | Mode | Measured Level dBm | Substitute Level dBm | Antenna Gain dBd | Pol H/V | ERP dBm | ERP Watts | Battery Type |
|---|---|---|---|---|---|---|---|---|
| 817.90 | BC10 | -7.6 | 24.4 | 0.0 | H | 24.4 | 0.275 | Standard |
| 823.10 | BC10 | -8.2 | 23.0 | 0.0 | H | 23.0 | 0.200 | Standard |

## 3.5 *Radiated Spurious Emissions*

### 3.5.1 Test Result

| Test Description | Basic Standards | Test Result |
|---|---|---|
| Radiated Spurious Emissions | FCC Part 2.1053<br>FCC Part 90.691 | Pass |

### 3.5.2 Test Method

The levels of the carrier and the various spurious and harmonics frequencies are measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB (specified in 90.691). Prescan measurements were performed with the use of a spectrum analyzer employing a resolution bandwidth of 1 MHz or greater and a video bandwidth of 1 MHz or greater. Emissions within 20 dB of the limit were measured using the substitution method.

The EUT was placed on a non-conductive table 80cm above a flush mounted turntable with a measurement antenna was place 3 meters away

A radio link was established between EUT and Radio Communications Tester. The output power of the EUT was set to maximum value by using the maximum power setting on the Radio Communications Tester.

The turntable was rotated from 0-360 degrees, the measurement antenna was raised from 1 to 4 meters in height in both vertical and horizontal polarizations, and the EUT was manipulated through each of its three orthogonal axes to capture the maximum reading on the spectrum analyzer.

Per the guidance of ANSI/TIA-603-C-2004, a half-wave dipole is then substituted in place of the EUT. For emissions above 1 GHz, a horn antenna is substituted in place of the EUT. The substitution antenna is driven by a signal generator with the level of the signal generator being used to obtain the same receive spectrum analyzer level previously recorded from the spurious emissions of the EUT. The power of the emission is calculated using the following formula:

$$P_{d[dBm]} = P_{g[dBm]} - \text{Cable Loss}_{[dB]} + \text{Antenna Gain}_{[dBd/dBi]}$$

Where Pd is the dipole equivalent power, Pg is the generator output to the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_{g[dBm]}$ - Cable $\text{Loss}_{[dB]}$.

The measurement was conducted at the low channel, 476, in RC3/SO55 as pre-scans showed this to yield the worst case test results.

### 3.5.3 Test Equipment

| Equipment | Model | Manufacturer | Asset Number | Cal Due Date |
|---|---|---|---|---|
| Receiver | ESU40 | R&S | B079629 | 25 Aug 2012 |
| Radio Communications Tester | CMW-500 | R&S | B085757 | 28 Sep 2012 |

| Equipment | Model | Manufacturer | Asset Number | Cal Due Date |
|---|---|---|---|---|
| DRWG Antenna | 3117 | ETS-Lindgren | B079691 | 31 May 2012 |
| DRWG Antenna | 3117 | ETS-Lindgren | B079699 | 21 May 2012 |
| Coaxial Cable | Sucoflex 106 | Huber+Suhner | B079656 | 12 Aug 2012 |
| Bilog Antenna | JB6 | Sunol | B079689 | 24 Aug 2012 |
| Coaxial Cable | Sucoflex 106 | Huber+Suhner | B079712 | 12 Aug 2012 |
| Coaxial Cable | Sucoflex 106 | Huber+Suhner | B079711 | 12 Aug 2012 |
| Coaxial Cable | Sucoflex 106 | Huber+Suhner | B085888 | 26 Sep 2012 |
| Dipole Antenna | 3121D | ETS-Lindgren | B085753 | 16 Mar 2012 |
| Signal Generator | HMC-T2240 | Hittite | B001212 | CNR |

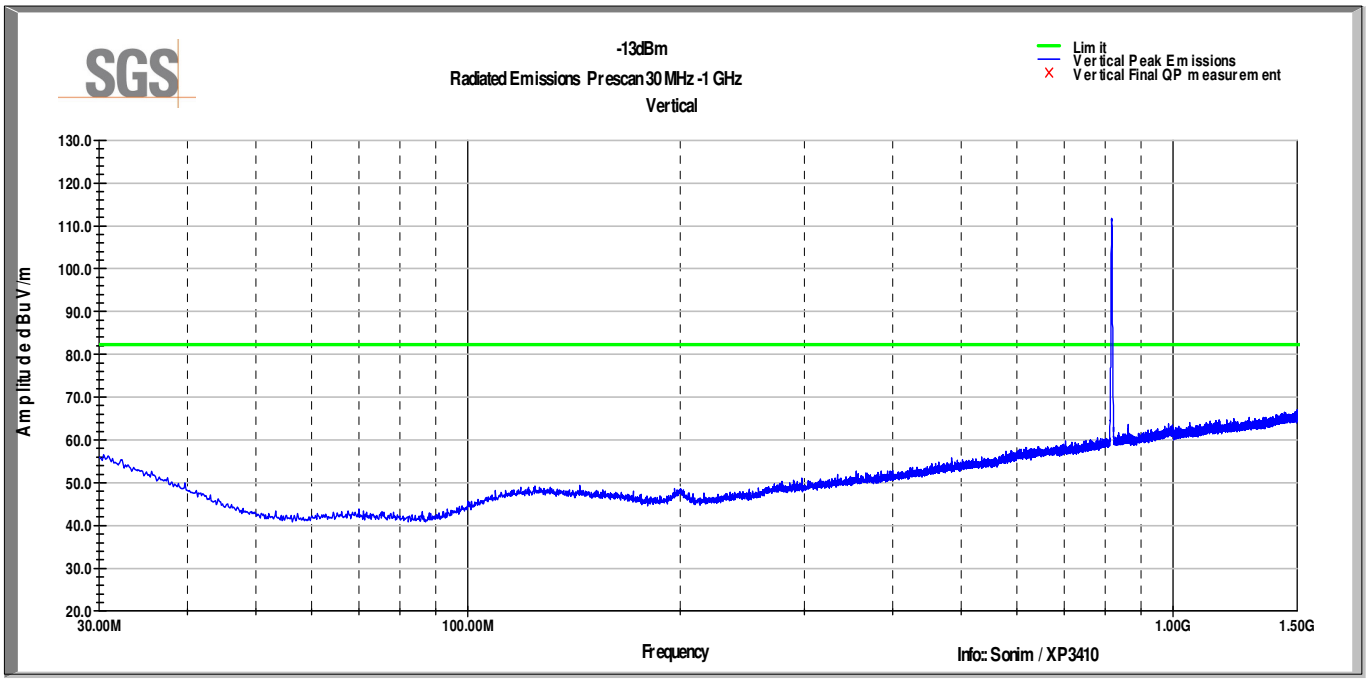
Note: The calibration period equipment is 1 year.

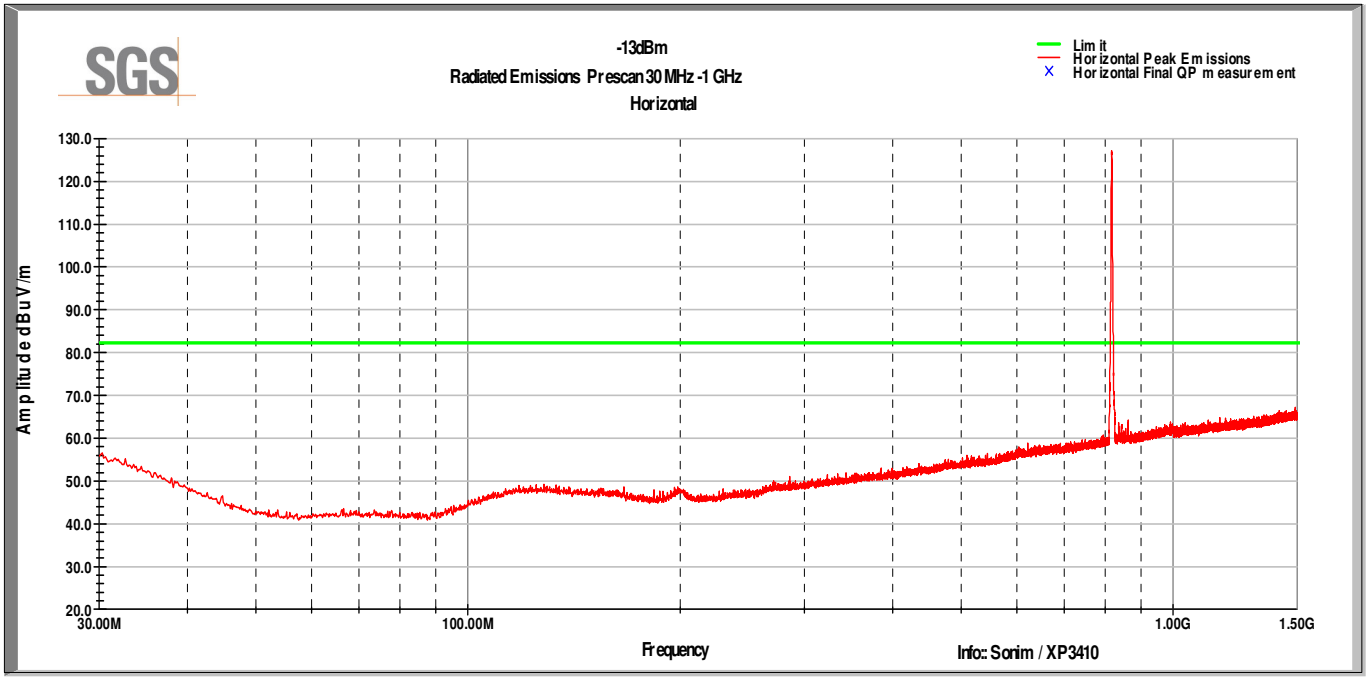
### 3.5.4 **Test Data**

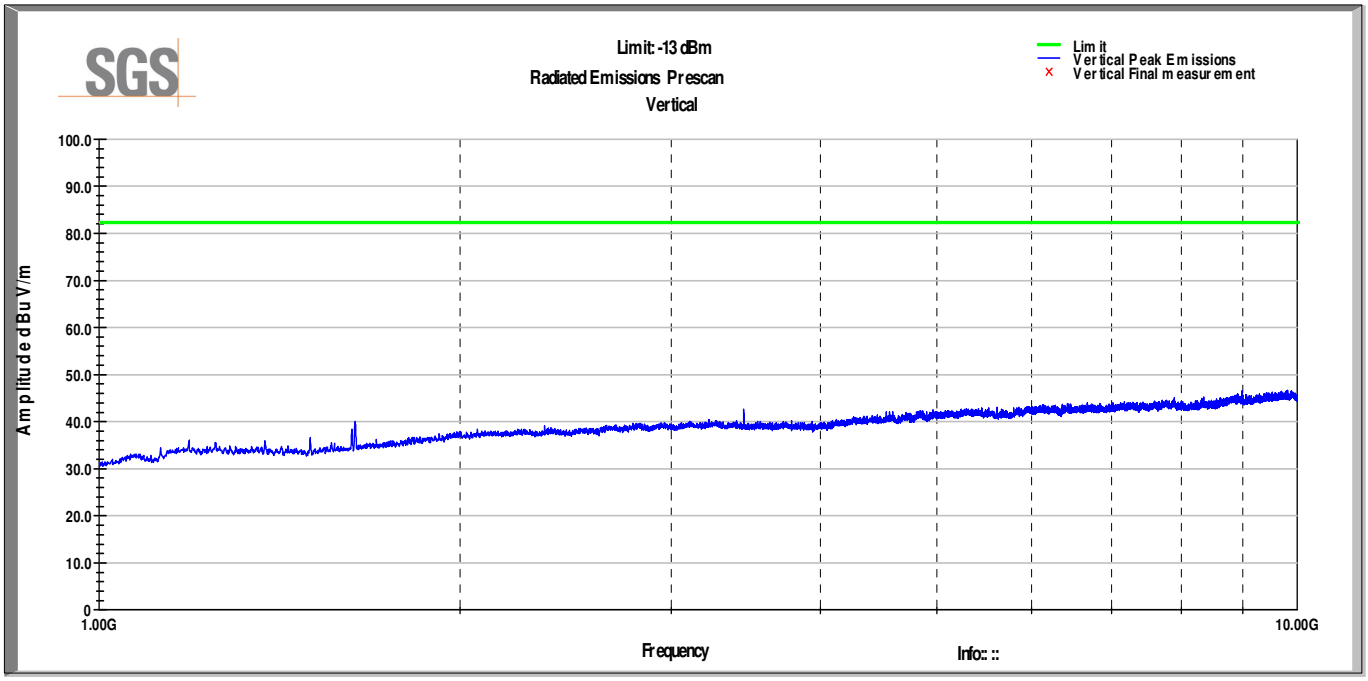
Test Date: 7 Aug 2012

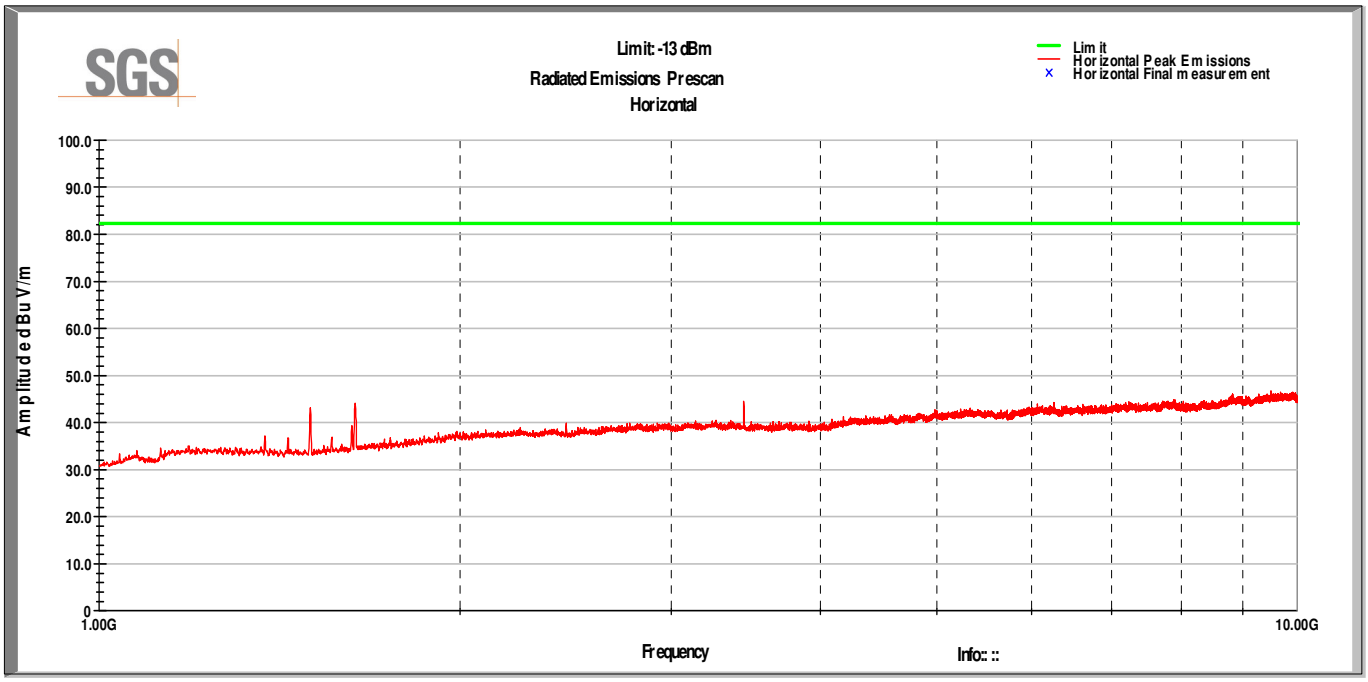
There were no spurious emissions within 20 dB of the limit.

### 3.5.5 **Plots**




Limit: -13 dBm
Radiated Emissions Prescan
Vertical
Limit
Vertical Peak Emissions
Vertical Final measurement
Amplitude dBuV/m
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
1.00G
10.00G
Frequency
Info: ::


Limit: -13 dBm
Radiated Emissions Prescan
Horizontal
Limit
Horizontal Peak Emissions
Horizontal Final measurement
Amplitude dBuV/m
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
1.00G
10.00G
Frequency
Info: ::

## 3.6 *Frequency Stability*

### 3.6.1 Test Result

| Test Description | Basic Standards | Test Result |
|---|---|---|
| Frequency Stability | FCC Part 2.1055<br>FCC Part 90.213 | Pass |

### 3.6.2 Test Method

The EUT was placed inside the Environmental Chamber and was left inside chamber to stabilize to set temperature for minimum of thirty minutes before any measurements were made. EUT was tested at BC10 channel 684 SO55 as pre-scans showed this to yield the worst case test results.

### 3.6.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

| | |
|---|---|
| Temperature: | 23.6 ℃ |
| Relative Humidity: | 56.8 % |
| Atmospheric Pressure: | 97.4 kPa |

### 3.6.4 Test Equipment

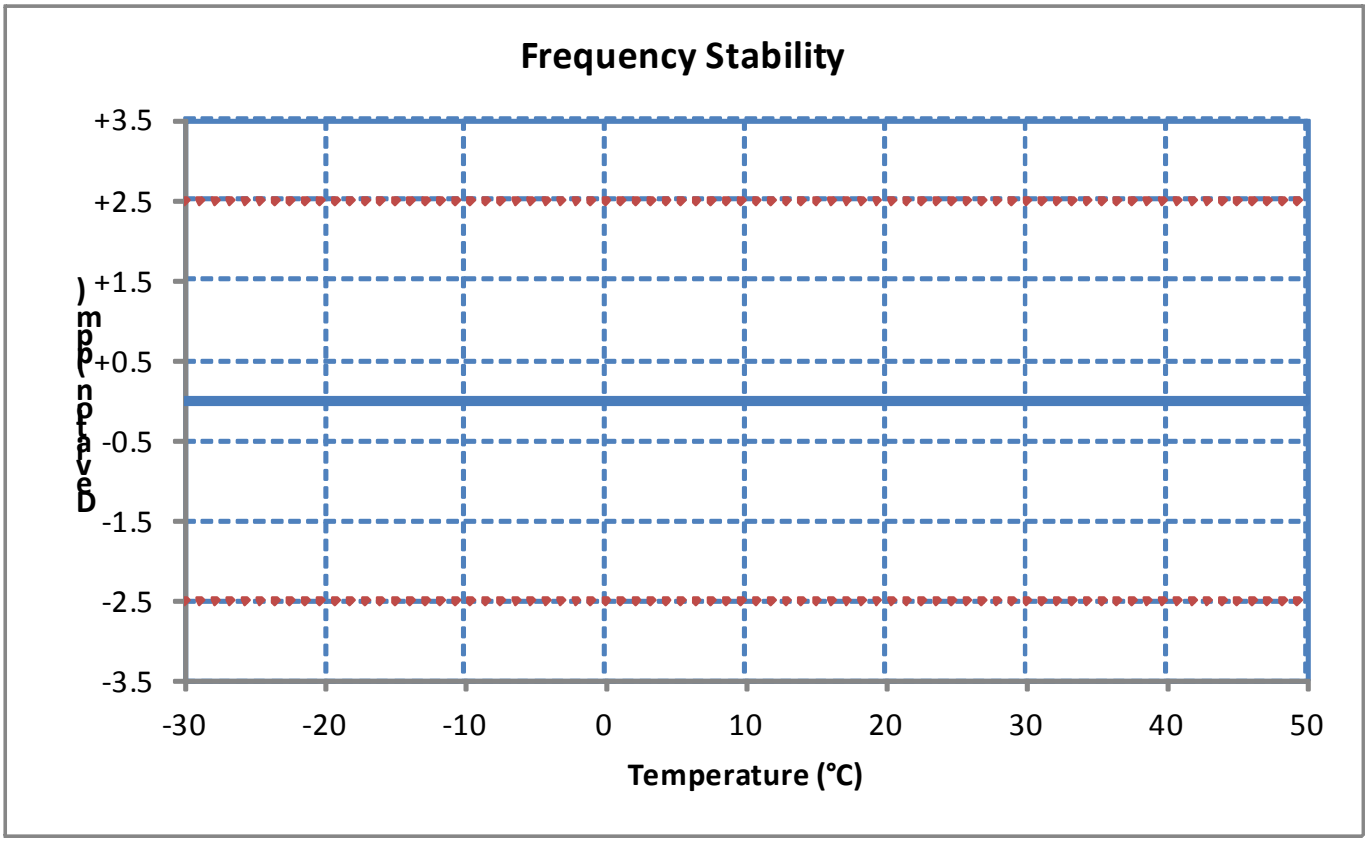
| Equipment | Model | Manufacturer | Asset Number | Cal Due Date |
|---|---|---|---|---|
| DC Power Supply | ZUP20-10 | TDK-Lambda | B079774 | 14Nov2012 |
| Wideband Radio Communications Tester | CMW500 | Rohde & Schwarz | B085757 | 28Sep2012 |
| Ultraflex Coaxial Cable | LMR-240 | Time Microwave Systems | B092135 | 20July2013 |
| Environmental Chamber | SM-16-8200 | Thermotron | B079727 | 8 Aug2013 |

Note: The calibration period equipment is 1 year.

### 3.6.5 Test Data

Test Date: 10 Aug 2012

| Voltage % | Power $V_{DC}$ | Temp °C | Frequency Hz | Freq Dev Hz | Freq Dev max Hz | Freq Dev ppm | Deviation % |
|---|---|---|---|---|---|---|---|
| 100% | 3.70 | +20 (Ref) | 823,100,000 | +0 | +11 | +0.01 | +0.000001 |
| 100% | 3.70 | -30 | 823,100,003 | +3 | -8 | -0.01 | -0.000001 |
| 100% | 3.70 | -20 | 823,099,998 | -2 | -5 | -0.01 | -0.000001 |
| 100% | 3.70 | -10 | 823,100,001 | +1 | +8 | +0.01 | +0.000001 |
| 100% | 3.70 | 0 | 823,100,001 | +1 | +6 | +0.01 | +0.000001 |
| 100% | 3.70 | +10 | 823,100,000 | -0 | -7 | -0.01 | -0.000001 |
| 100% | 3.70 | +20 | 823,099,998 | -2 | -10 | -0.01 | -0.000001 |
| 100% | 3.70 | +30 | 823,100,000 | +0 | -8 | -0.01 | -0.000001 |
| 100% | 3.70 | +40 | 823,099,997 | -3 | -7 | -0.01 | -0.000001 |
| 100% | 3.70 | +50 | 823,100,001 | +1 | +6 | +0.01 | +0.000001 |
| 115% | 4.23 | +20 | 823,099,996 | -4 | -6 | -0.01 | -0.000001 |
| Battery End | 3.35 | +20 | 823,100,000 | +0 | -7 | -0.01 | -0.000001 |



# 4 Revision History

| Revision Level | Description of changes | Revision Date |
|---|---|---|
| 0 | Initial release | 28 AUG 2012 |
| 1 | Revised per reviewer comments | 27 Sep 2012 |
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