



**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 22 Subpart H for Cellular Devices and FCC Part 24 Subpart E for Broadband PCS Devices.

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-FCC22\_24 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 22 Subpart H for Cellular Devices  
&  
Part 24 Subpart E for Broadband PCS Devices**

**MET Report: EMC88789-FCC22\_24 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**



## Electromagnetic Compatibility Criteria Test Report

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Part 22 Subpart H for Cellular Devices  
&  
Part 24 Subpart E for Broadband PCS Devices**

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 22 Subpart H and Part 24 Subpart E of the FCC Rules under normal use and maintenance.

Asad Bajwa,  
Director, Electromagnetic Compatibility Lab



## Report Status Sheet

| Revision | Report Date        | Reason for Revision   |
|----------|--------------------|-----------------------|
| Ø        | August 9, 2016     | Initial Issue.        |
| 1        | September 14, 2016 | Engineer corrections. |



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## List of Terms and Abbreviations

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



# **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 22 Subpart H and Part 24 Subpart E. 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 22 Subpart H and Part 24 Subpart E, in accordance with CommScope, purchase order number 60210.

| FCC Reference                | Description                                                        | Compliance |
|------------------------------|--------------------------------------------------------------------|------------|
| §2.1049; §22.917; §24.232(d) | Occupied Bandwidth                                                 | Compliant  |
| §2.1049, §24.238             | Frequency stability                                                | Compliant  |
| §24.323 (d)                  | Peak to Average Ration                                             | Compliant  |
| §2.1051; §22.917, §24.238    | Conducted Spurious Emissions at Antenna<br>Terminals and Band Edge | Compliant  |
| §2.1046; §22.913; §24.232    | RF Power Output (EIRP)                                             | Compliant  |
| §2.1053; §22.917, §24.238    | Radiated Spurious Emissions from the Cabinet                       | 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: 120VAC, 60Hz/12VDC                       |                        |                         |
|                                       | FCC ID: QHY-S1000C                                      |                        |                         |
|                                       | Type of Modulations:                                    | CDMA                   |                         |
|                                       | Equipment Code:                                         | AMP                    |                         |
|                                       | RF Power Output                                         | Part 22 ERP: 1.18 (mW) | Part 24 EIRP: 7.27 (mW) |
|                                       | EUT Frequency Ranges:                                   | 869-894 MHz            | 1930-1990 MHz           |
| <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 22, Subpart H</b>    | Federal Communication Commission, Code of Federal Regulations, Title 47, Part 22: Rules and Regulations for Cellular Devices.                |
| <b>CFR 47, Part 24, Subpart E</b>    | Federal Communication Commission, Code of Federal Regulations, Title 47, Part 24: Rules and Regulations for Personal Communications Services |
| <b>RSS-132 Issue 3 January 2013</b>  | Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz                                                                |
| <b>RSS-133 Issue 6 January 2013</b>  | 2 GHz Personal Communications Services                                                                                                       |
| <b>RSS-GEN Issue 4 November 2014</b> | General Requirements for Compliance of Radio Apparatus                                                                                       |
| <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 use in the Small to Medium Business's to provide indoor voice and data coverage.

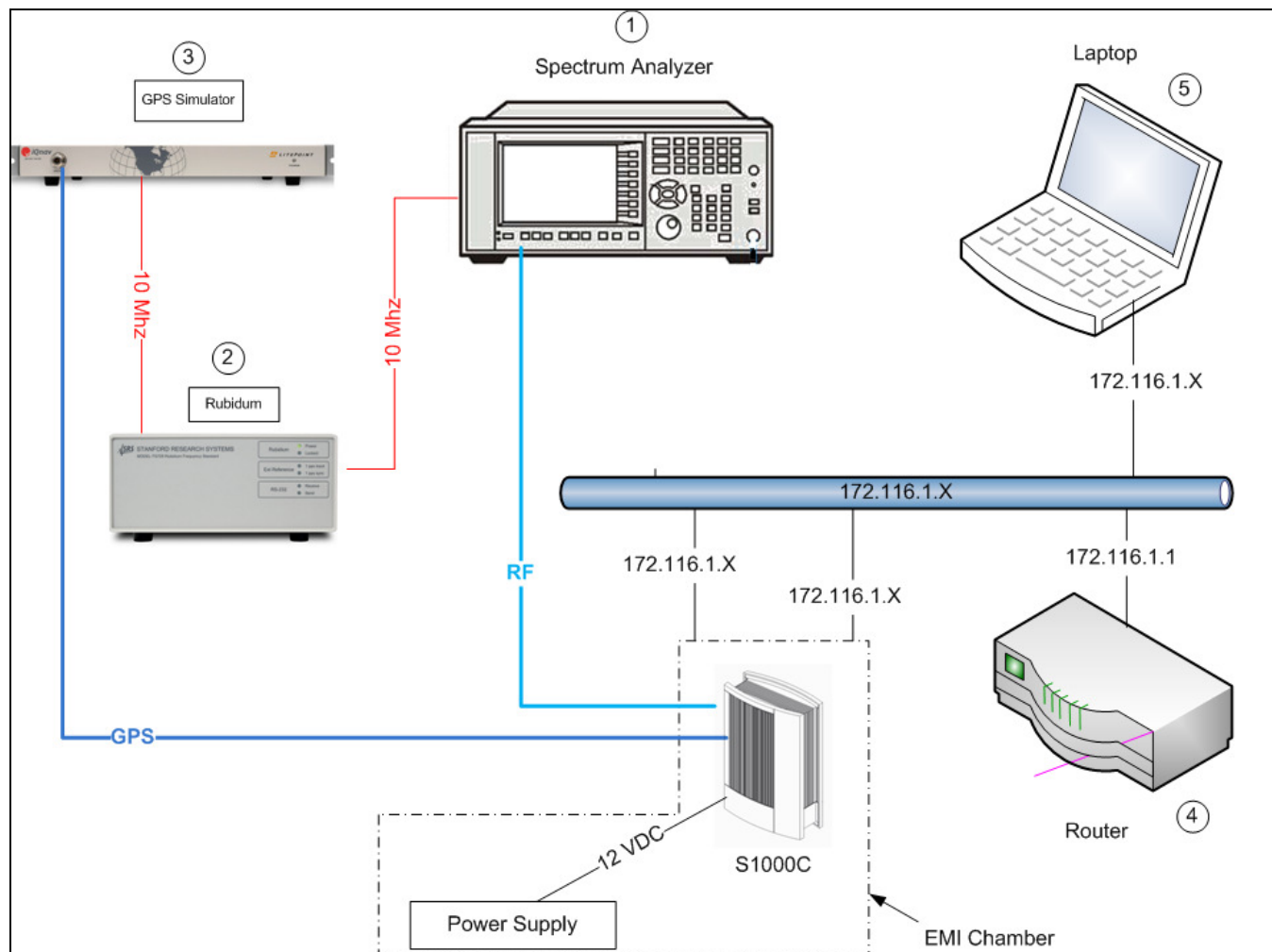


Figure 1. Block Diagram of Equipment Configuration

## 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

### § 2.1046 RF Power Output

**Test Requirements:** § 2.1046 Measurements required: RF power output:

§ 2.1046 (a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

§ 2.1046 (b) For single sideband, independent sideband, and single channel, controlled carrier radiotelephone transmitters, the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as specified and as applicable in § 2.1046 (b) (1-5). In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.

§ 2.1046 (c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

#### § 22.913 Power and antenna height limits.

§ 22.913(a): The Effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 watts.

#### § 24.232 Power and antenna height limits.

§ 24.232 (a): (1) Base stations with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(2) Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

**Test Procedures:** As required by 47 CFR 2.1046, RF power output measurements were made at the RF output terminals using an attenuator and spectrum analyzer or power meter. The spectrum analyzer was used in accordance with the licensed measurement guidance procedures. The “Channel Power” measurement feature of the spectrum analyzer was used. Measurements were taken in both high and low power modes, as permissible by compliance with Intermodulation requirements. Lower power mode must be used when operating in multi-channel mode.

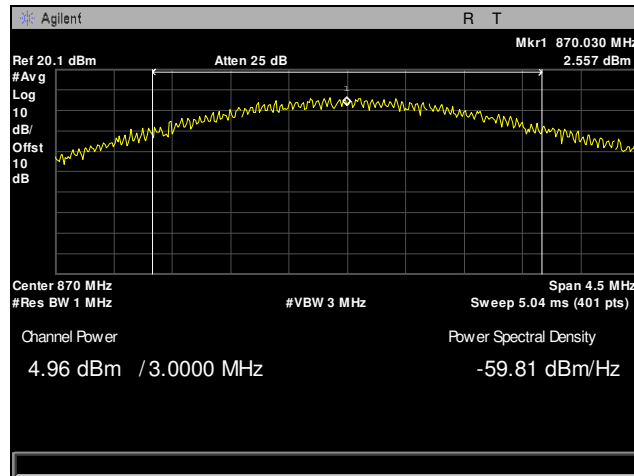
**Test Results:** The EUT complies with the requirements of this section.

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

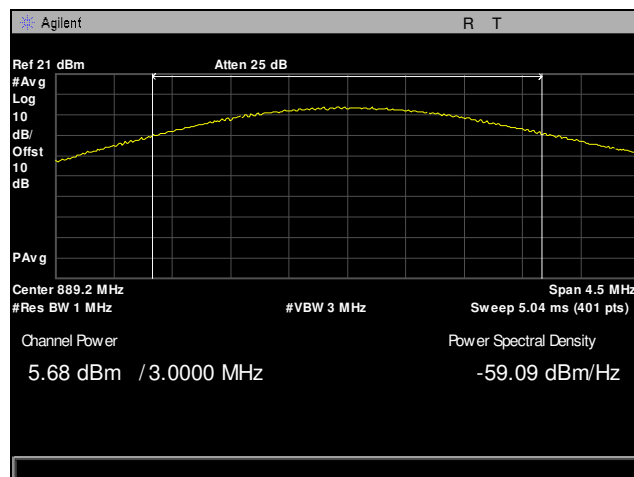
**Test Date(s):** 07/27/16



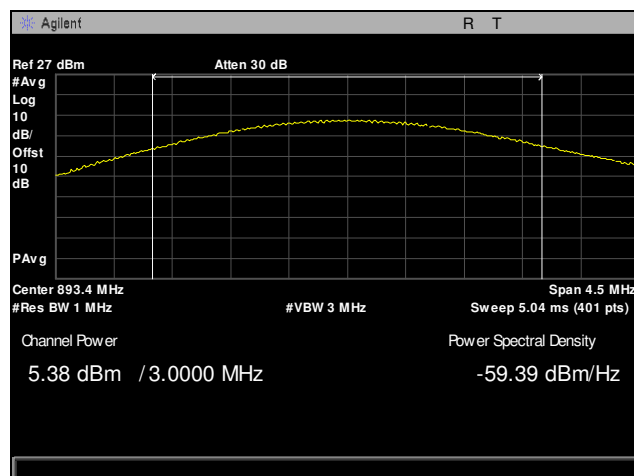
## RF Power Output, Beacon Radio, BC0



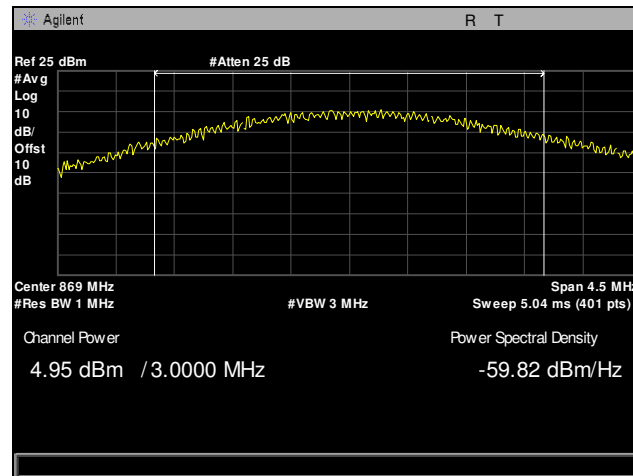
Plot 1. RF Output Power, Beacon Radio, BC0, Channel 1, Average



Plot 2. RF Output Power, Beacon Radio, BC0, Channel 640, Average



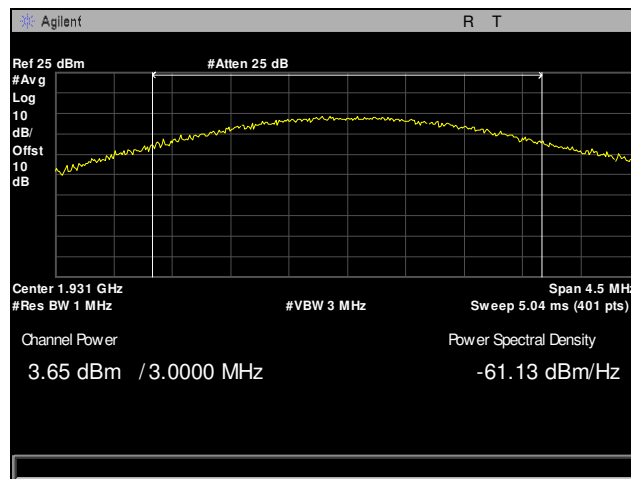
Plot 3. RF Output Power, Beacon Radio, BC0, Channel 779, Average



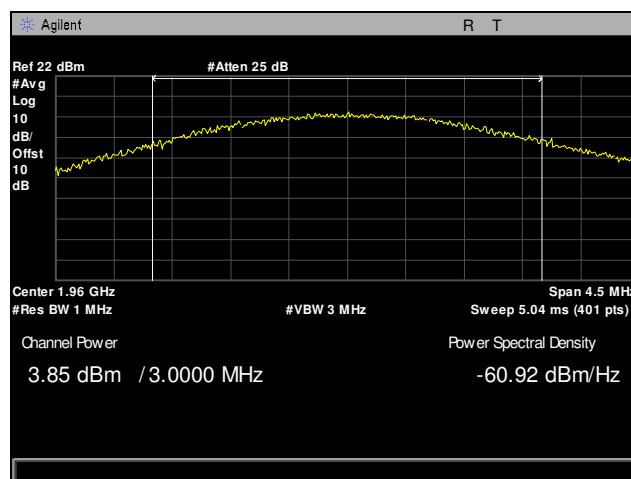
Plot 4. RF Output Power, Beacon Radio, BC0, Channel 991, Average



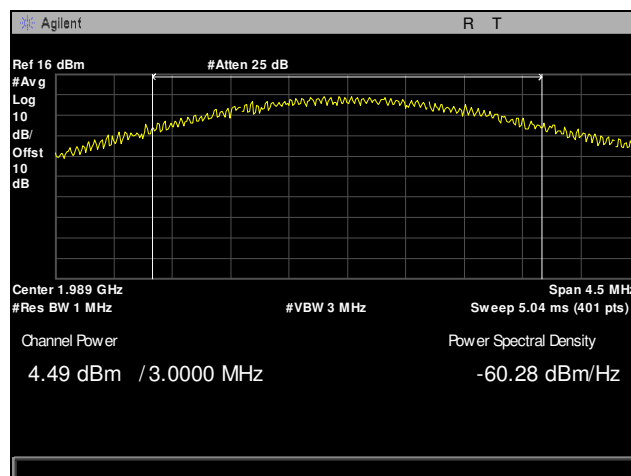
## RF Power Output, Beacon Radio, BC1



Plot 5. RF Output Power, Beacon Radio, BC1, Channel 25, Average



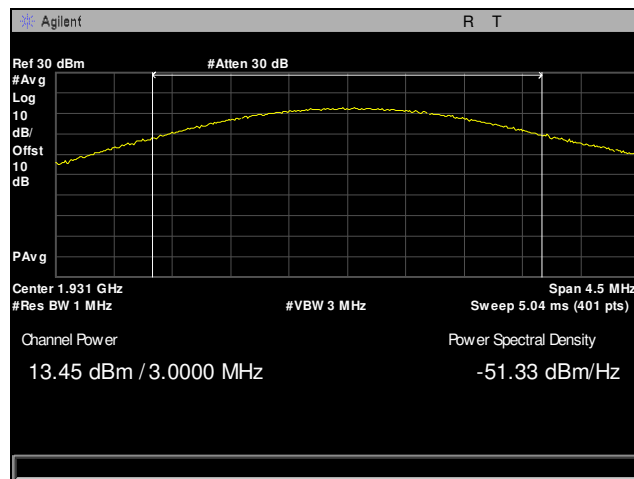
Plot 6. RF Output Power, Beacon Radio, BC1, Channel 600, Average



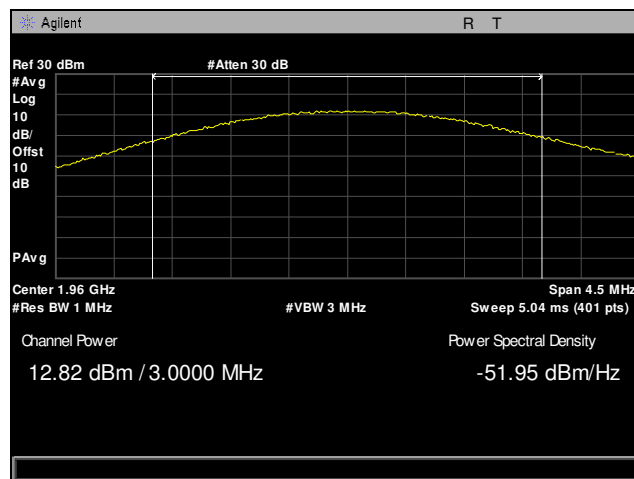
Plot 7. RF Output Power, Beacon Radio, BC1, Channel 1175, Average



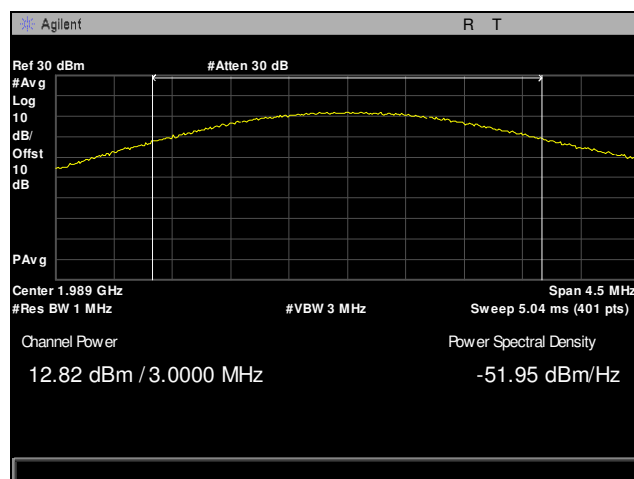
**EVDO BC1**



**Plot 8. RF Output Power, EVDO Radio, BC1, Channel 25, Average**



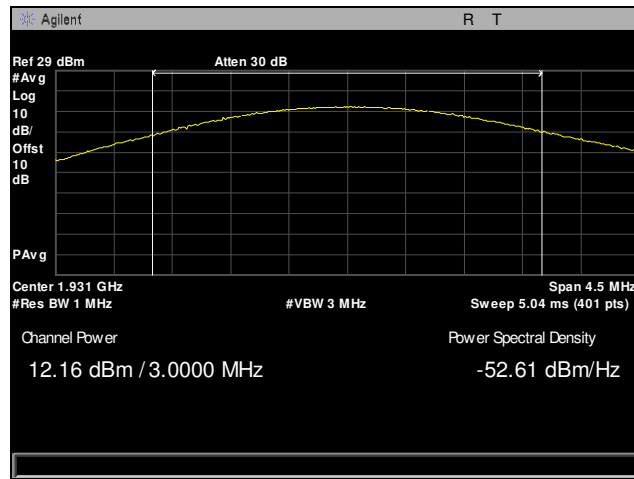
**Plot 9. RF Output Power, EVDO Radio, BC1, Channel 600, Average**



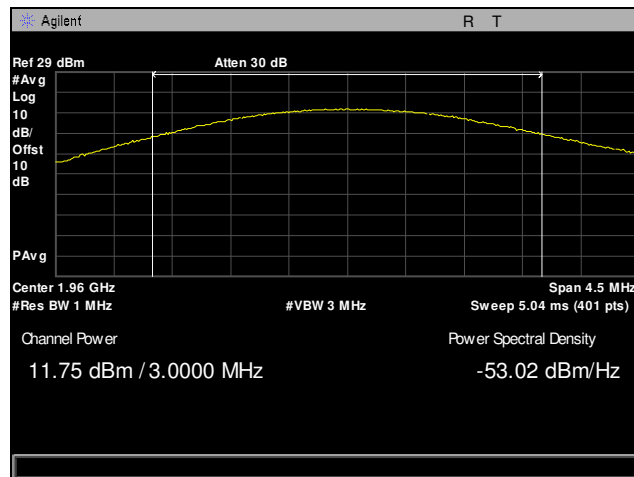
**Plot 10. RF Output Power, EVDO Radio, BC1, Channel 1175, Average**



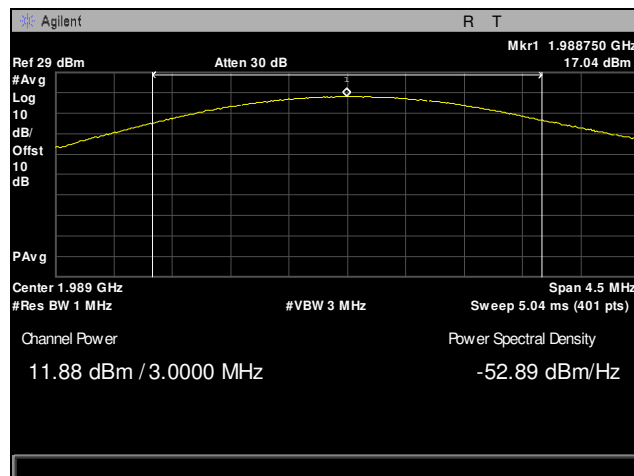
**ONEX Radio**



**Plot 11. Plot RF Output Power, ONEx Radio, BC1, Channel 25, Average**



**Plot 12. Plot RF Output Power, ONEx Radio, BC1, Channel 600, Average**



**Plot 13. Plot RF Output Power, ONEx Radio, BC1, Channel 1175, Average**



## § 2.1049 Occupied Bandwidth

**Test Requirement(s):**    **§ 2.1049 Measurements required: Occupied bandwidth:** The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the specified conditions of § 2.1049 (a) through (i) as applicable.

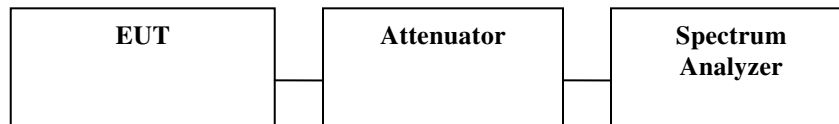
**Test Procedures:**        As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made at the RF output terminals using a Spectrum Analyzer.

A laptop was connected to EUT to control the RF frequency channel. The EUT was connected to a Spectrum Analyzer via attenuator. The RBW of the Spectrum Analyzer was set in accordance with the licensed measurement guidance procedures. Measurements were carried out at the low, mid, and high channels of the TX band.

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

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

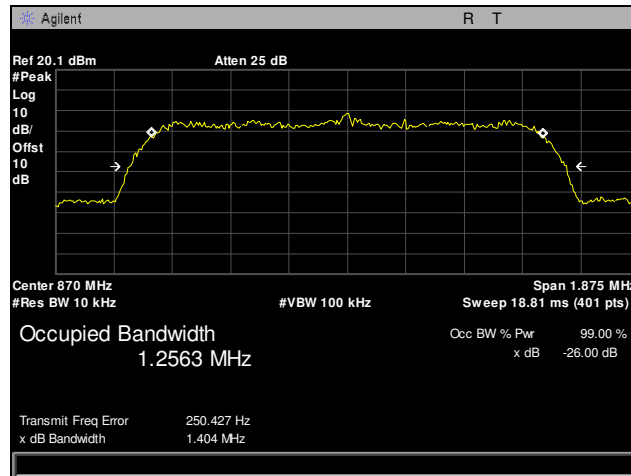
**Test Date(s):**            07/26/16



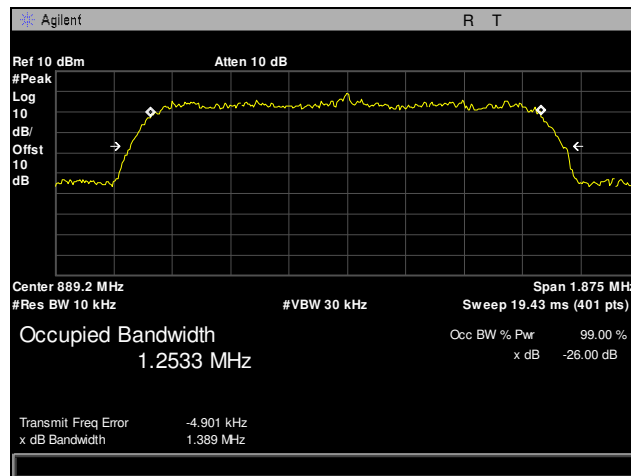
**Figure 2. Occupied Bandwidth Test Setup**



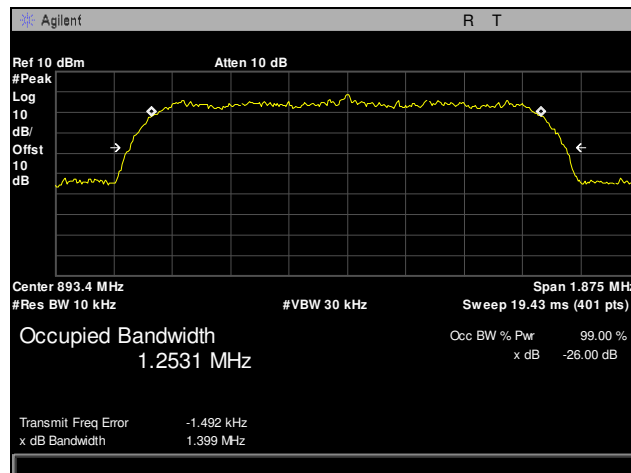
## Occupied Bandwidth, Beacon Radio, BC0



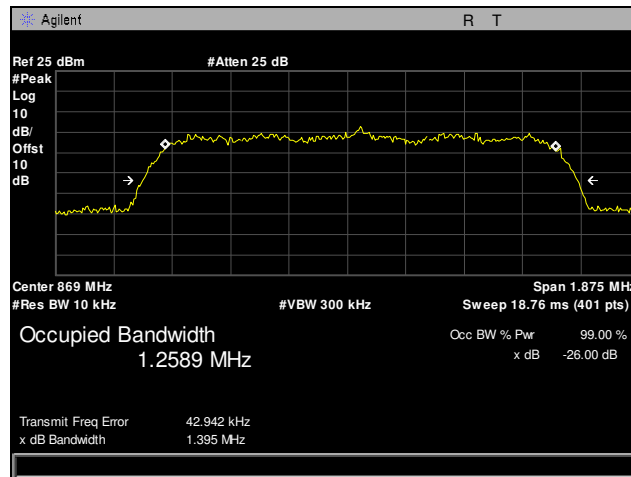
Plot 14. Occupied Bandwidth, Beacon Radio, BC0, Channel 1



Plot 15. Occupied Bandwidth, Beacon Radio, BC0, Channel 640



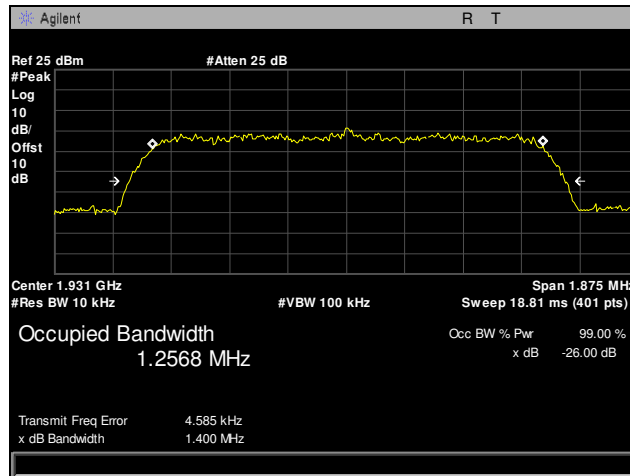
Plot 16. Occupied Bandwidth, Beacon Radio, BC0, Channel 779



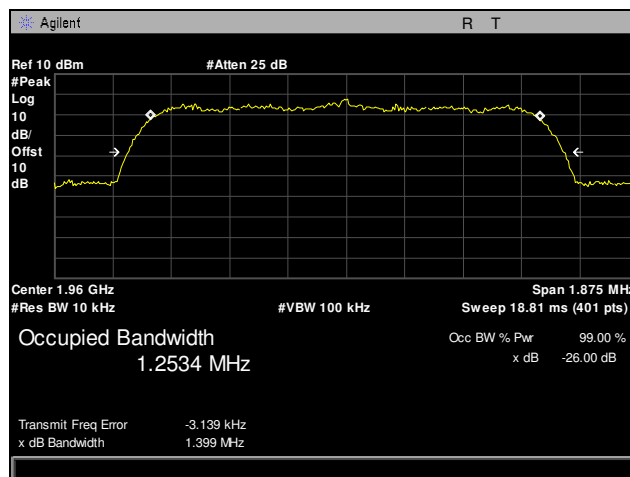
Plot 17. Occupied Bandwidth, Beacon Radio, BC0, Channel 991



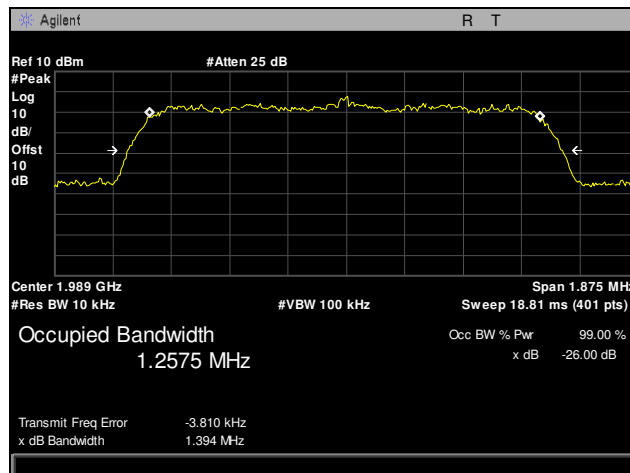
## Occupied Bandwidth, Beacon Radio, BC1



Plot 18. Occupied Bandwidth, Beacon Radio, BC1, Channel 25

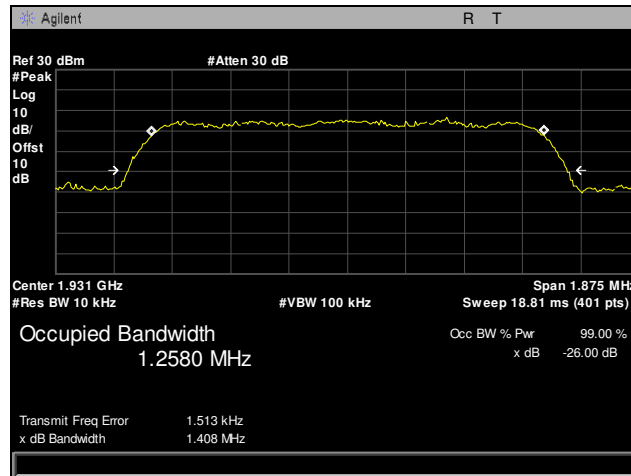


Plot 19. Occupied Bandwidth, Beacon Radio, BC1, Channel 600

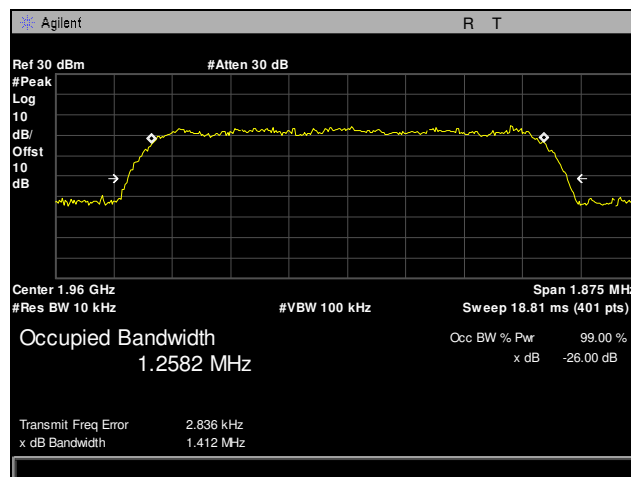


Plot 20. Occupied Bandwidth, Beacon Radio, BC1, Channel 1175

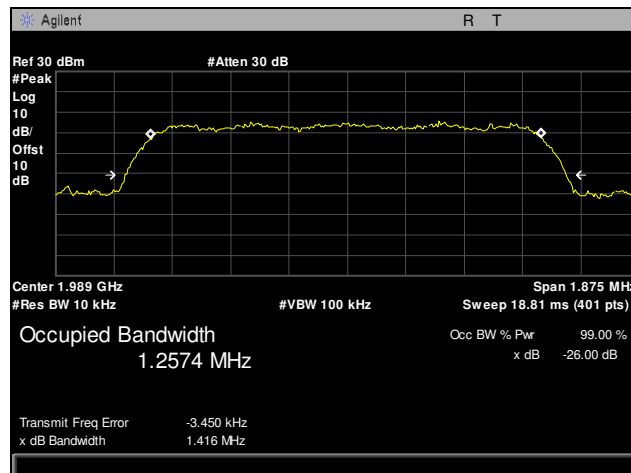
## Occupied Bandwidth, EVDO Radio, BC1



Plot 21. Occupied Bandwidth, EVDO Radio, BC1, Channel 25

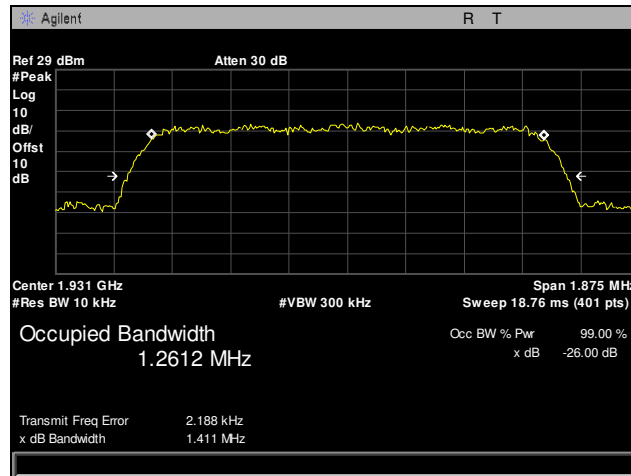


Plot 22. Occupied Bandwidth, EVDO Radio, BC1, Channel 600

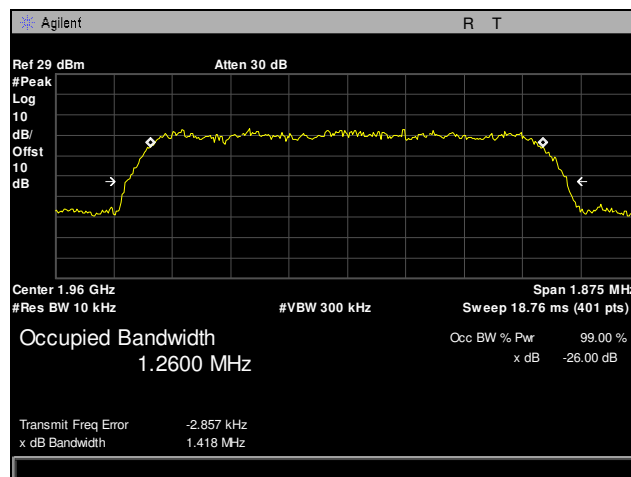


Plot 23. Occupied Bandwidth, EVDO Radio, BC1, Channel 1175

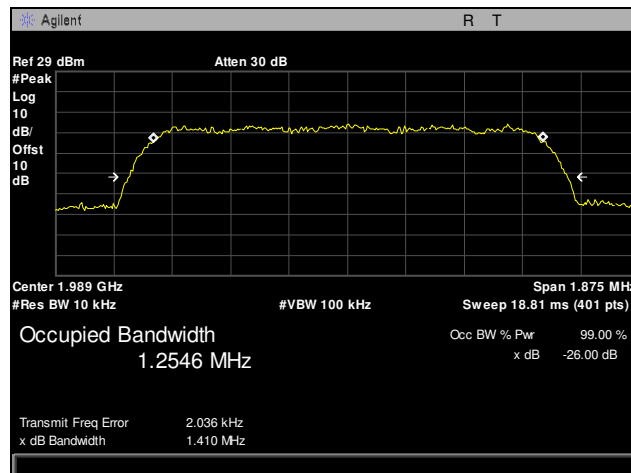
## Occupied Bandwidth, OneX Radio, BC1



Plot 24. Occupied Bandwidth, OneX Radio, BC1, Channel 25



Plot 25. Occupied Bandwidth, OneX Radio, BC1, Channel 600



Plot 26. Occupied Bandwidth, OneX Radio, BC1, Channel 1175



## 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.

§ 22.917 **Emission limitations Cellular equipment:** The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

§ 22.917 (a): Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$ .



**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° 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, whichever 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.

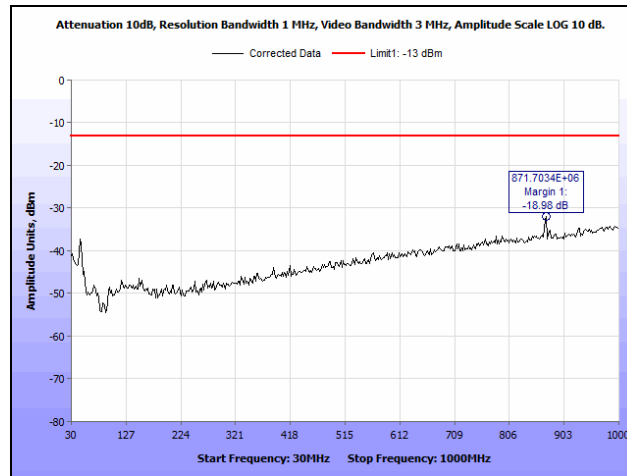
**Test Results:** The EUT complies with the requirements of this section.

**Test Engineer:** Djed Mouada

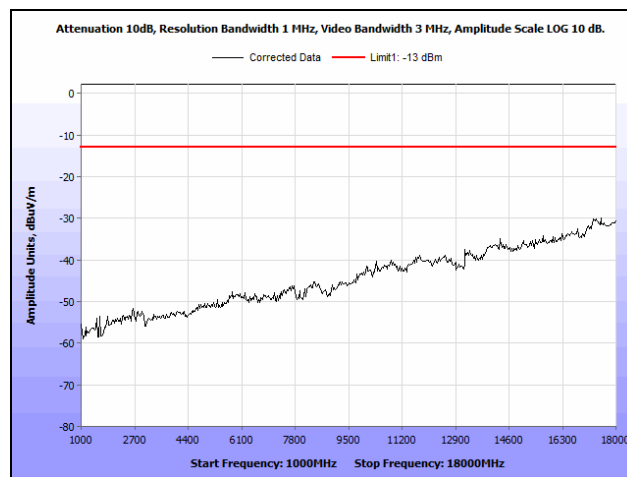
**Test Date(s):** 07/26/16



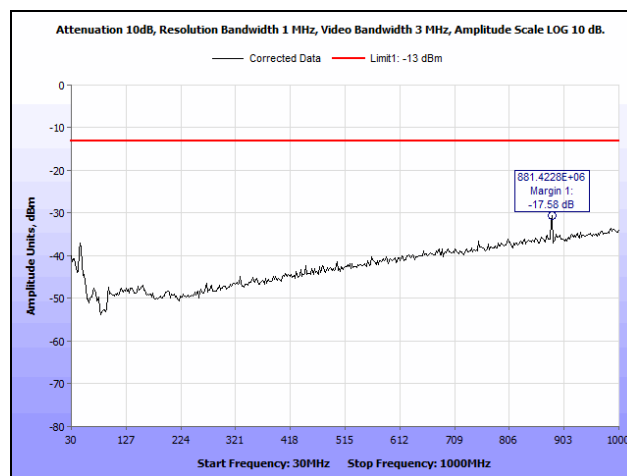
## Radiated Spurious Emissions, Beacon Radio, BC0



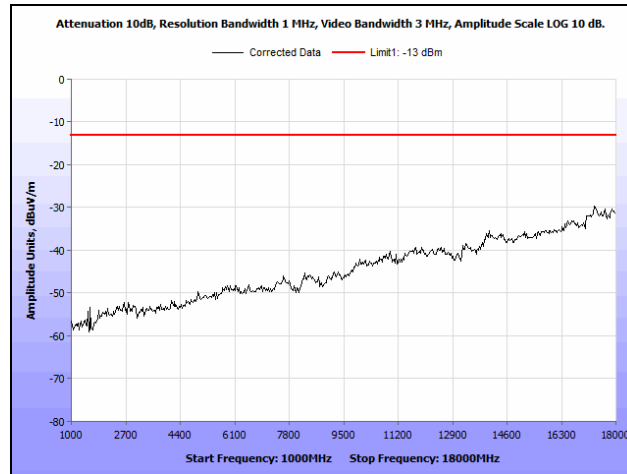
Plot 27. Radiated Spurious Emissions, Beacon Radio, BC0, Low Channel, 30 MHz – 1 GHz



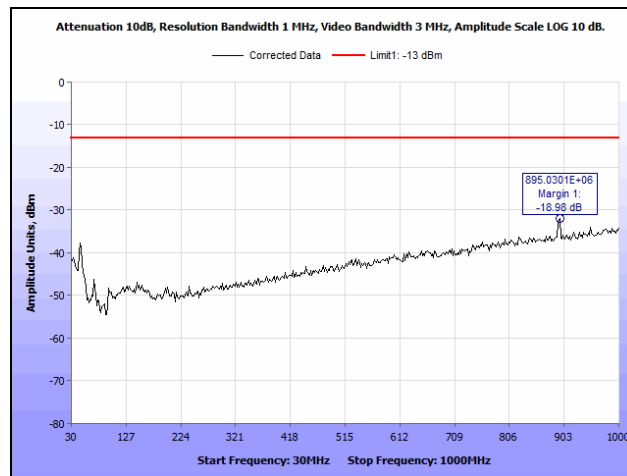
Plot 28. Radiated Spurious Emissions, Beacon Radio, BC0, Low Channel, 1 GHz – 18 GHz



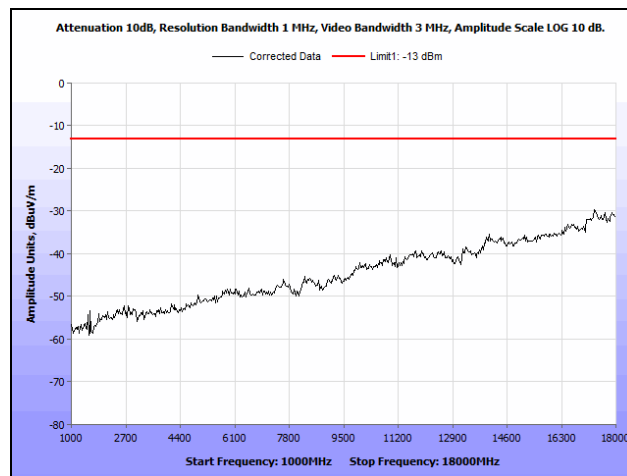
Plot 29. Radiated Spurious Emissions, Beacon Radio, BC0, Mid Channel, 30 MHz – 1 GHz



Plot 30. Radiated Spurious Emissions, Beacon Radio, BC0, Mid Channel, 1 GHz – 18 GHz

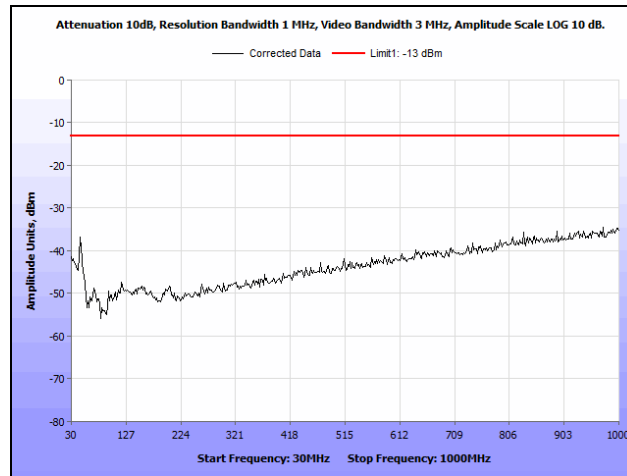


Plot 31. Radiated Spurious Emissions, Beacon Radio, BC0, High Channel, 30 MHz – 1 GHz

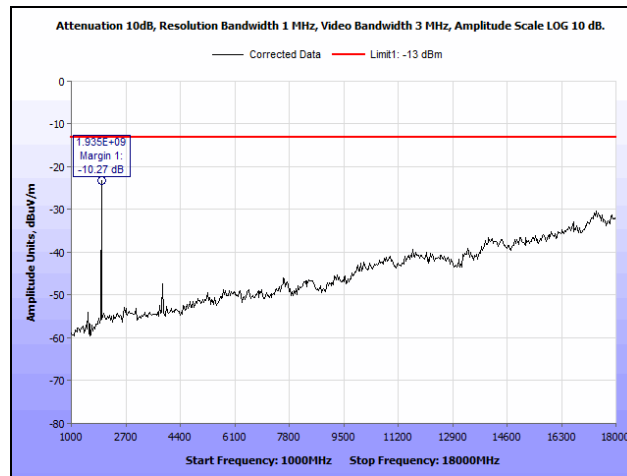


Plot 32. Radiated Spurious Emissions, Beacon Radio, BC0, High Channel, 1 GHz – 18 GHz

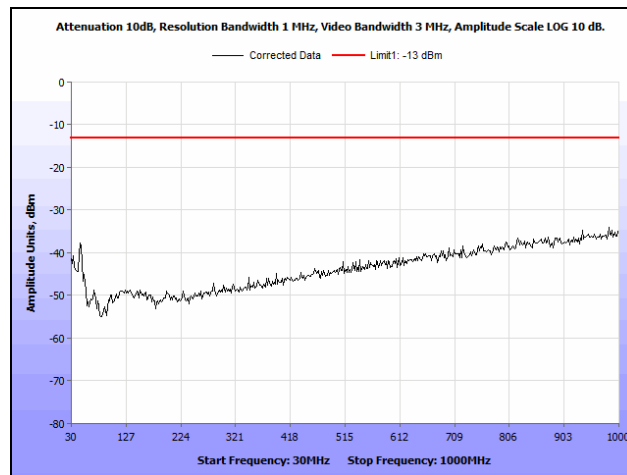
## Radiated Spurious Emissions, Beacon Radio, BC1



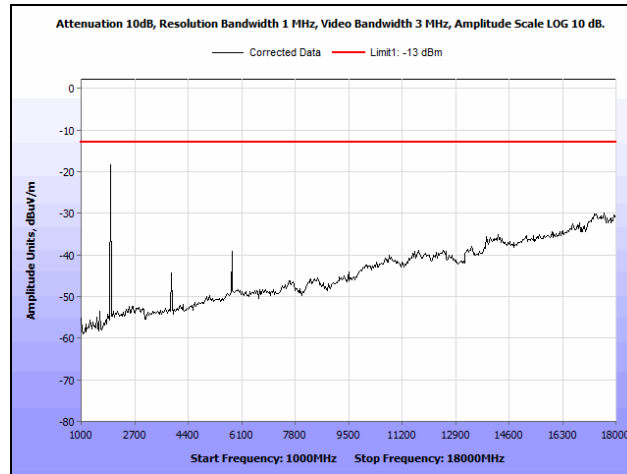
Plot 33. Radiated Spurious Emissions, Beacon Radio, BC1, Low Channel, 30 MHz – 1 GHz



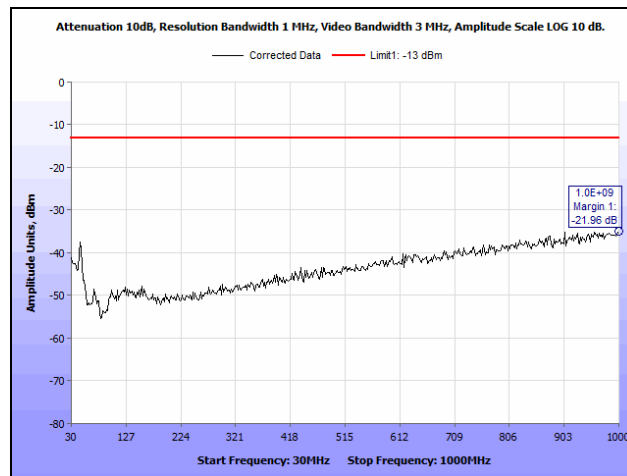
Plot 34. Radiated Spurious Emissions, Beacon Radio, BC1, Low Channel, 1 GHz – 18 GHz



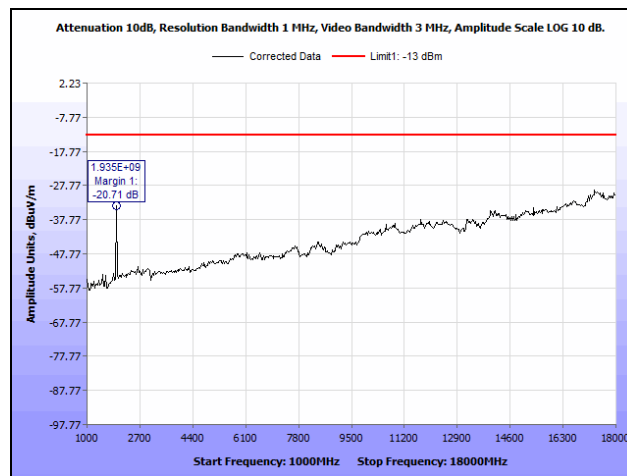
Plot 35. Radiated Spurious Emissions, Beacon Radio, BC1, Mid Channel, 30 MHz – 1 GHz



Plot 36. Radiated Spurious Emissions, Beacon Radio, BC1, Mid Channel, 1 GHz – 18 GHz



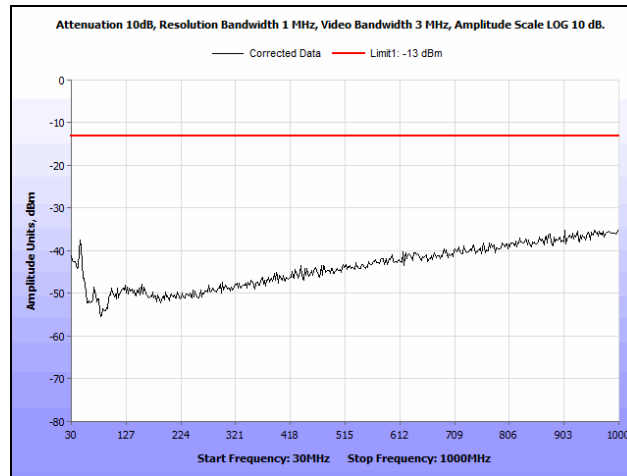
Plot 37. Radiated Spurious Emissions, Beacon Radio, BC1, High Channel, 30 MHz – 1 GHz



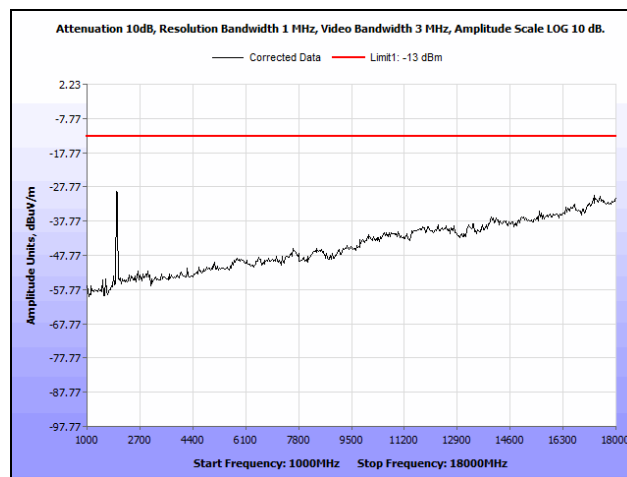
Plot 38. Radiated Spurious Emissions, Beacon Radio, BC1, High Channel, 1 GHz – 18 GHz



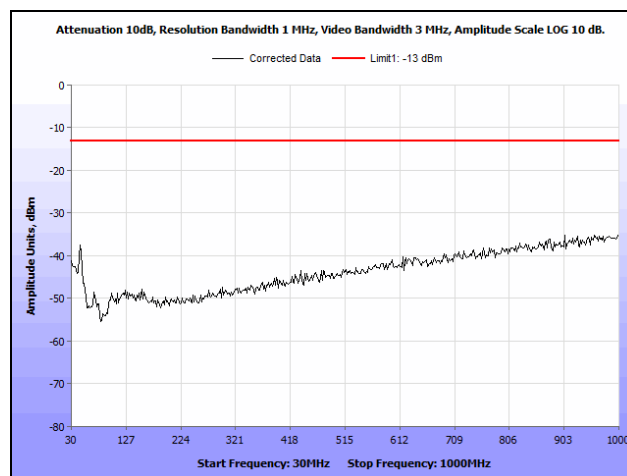
## Radiated Spurious Emissions, EVDO Radio, BC1



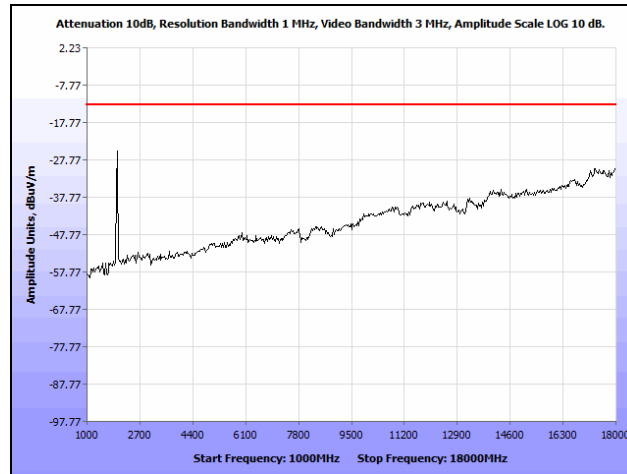
Plot 39. Radiated Spurious Emissions, EVDO Radio, BC1, Low Channel, 30 MHz – 1 GHz



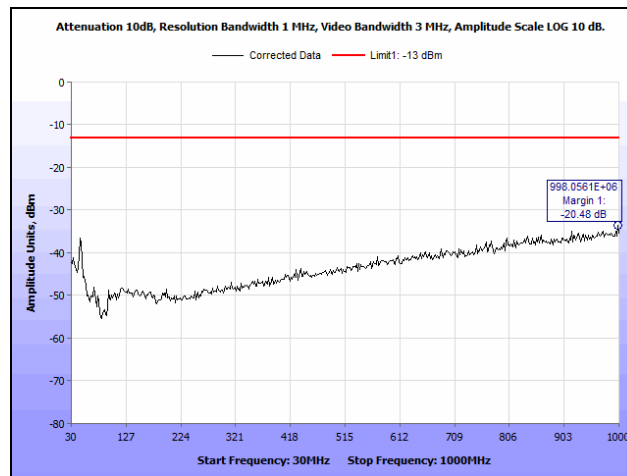
Plot 40. Radiated Spurious Emissions, EVDO Radio, BC1, Low Channel, 1 GHz – 18 GHz



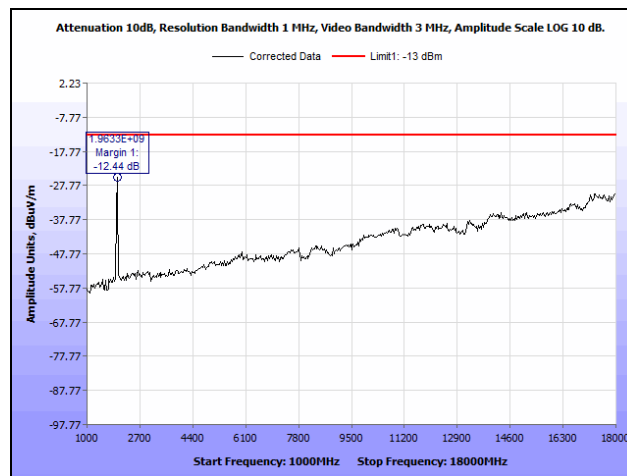
Plot 41. Radiated Spurious Emissions, EVDO Radio, BC1, Mid Channel, 30 MHz – 1 GHz



Plot 42. Radiated Spurious Emissions, EVDO Radio, BC1, Mid Channel, 1 GHz – 18 GHz

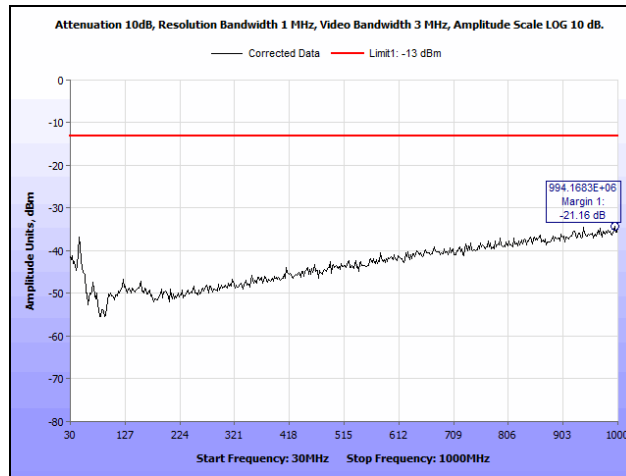


Plot 43. Radiated Spurious Emissions, EVDO Radio, BC1, High Channel, 30 MHz – 1 GHz

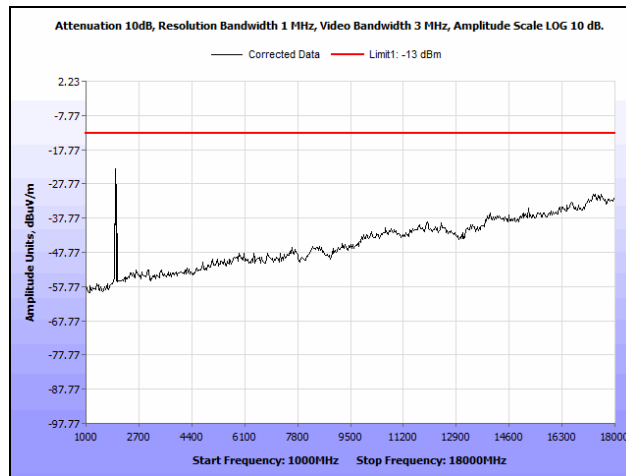


Plot 44. Radiated Spurious Emissions, EVDO Radio, BC1, High Channel, 1 GHz – 18 GHz

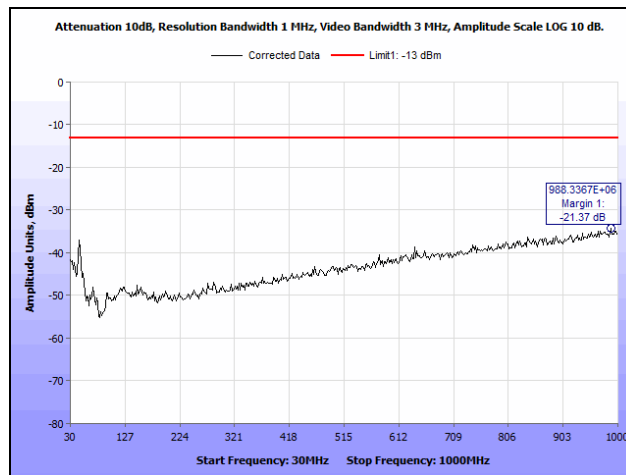
## Radiated Spurious Emissions, OneX Radio, BC1



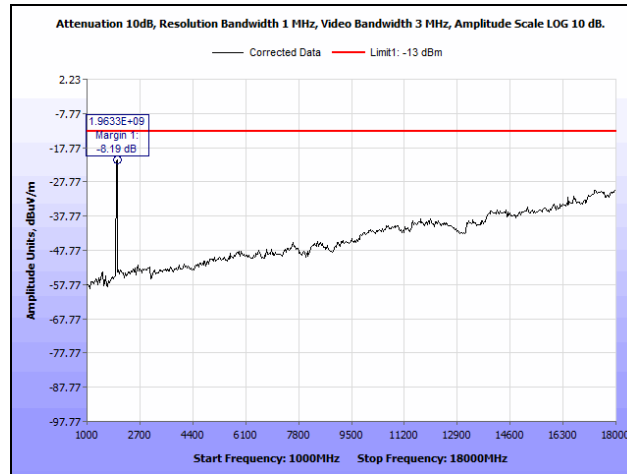
Plot 45. Radiated Spurious Emissions, OneX Radio, BC1, Low Channel, 30 MHz – 1 GHz



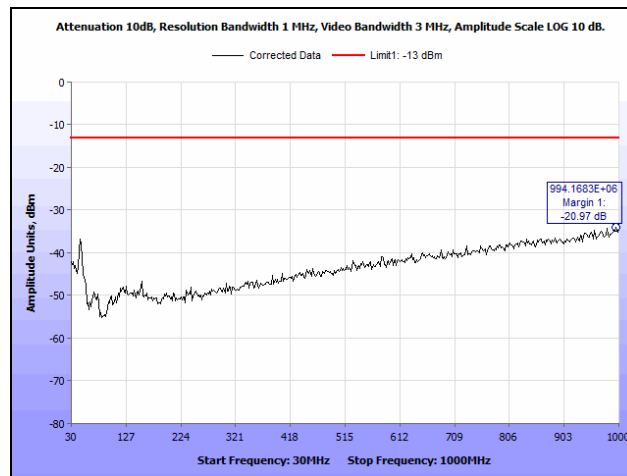
Plot 46. Radiated Spurious Emissions, OneX Radio, BC1, Low Channel, 1 GHz – 18 GHz



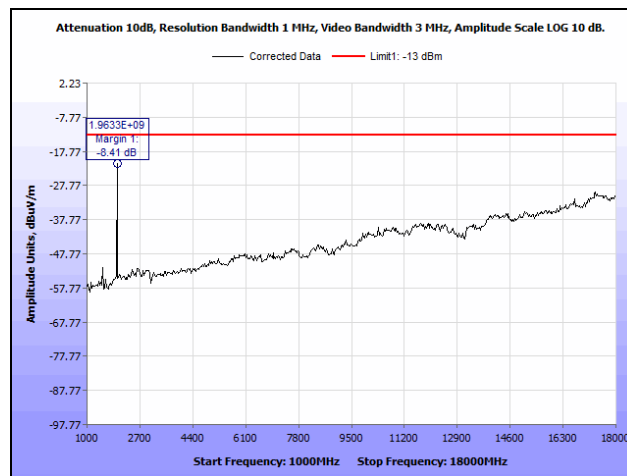
Plot 47. Radiated Spurious Emissions, OneX Radio, BC1, Mid Channel, 30 MHz – 1 GHz



Plot 48. Radiated Spurious Emissions, OneX Radio, BC1, Mid Channel, 1 GHz – 18 GHz



Plot 49. Radiated Spurious Emissions, OneX Radio, BC1, High Channel, 30 MHz – 1 GHz



Plot 50. Radiated Spurious Emissions, OneX Radio, BC1, High Channel, 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.

§ 22.917 The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

§ 22.917 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

§ 22.917 (b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 30 kHz or more. In the 60 kHz bands immediately outside and adjacent to the authorized frequency range or channel, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy approved the measured power is integrated over the full required measurement bandwidth (i.e., 30 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

§24.238 **Emission limitations for Broadband PCS equipment:** The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

§ 24.238 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

§ 24.238 (b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.



**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.

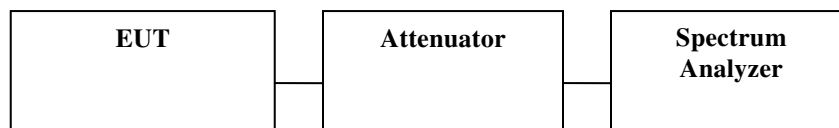
A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer through an attenuator. The Spectrum Analyzer was set to sweep 30 MHz and up to 10<sup>th</sup> harmonic of the fundamental or 40 GHz whichever is the lesser. Measurements were 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

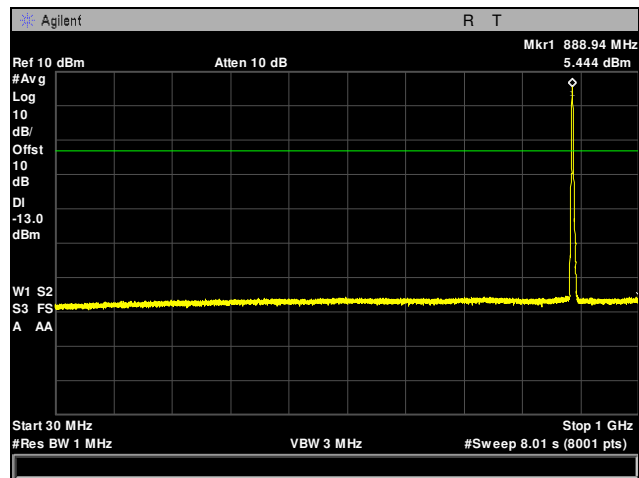
**Test Date(s):** 07/26/16



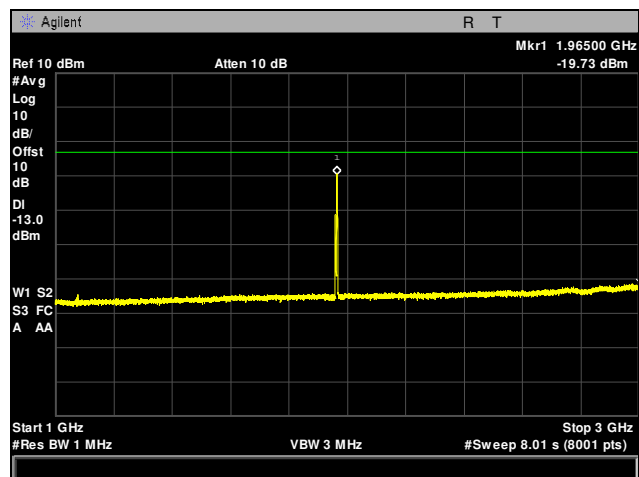
**Figure 3. Spurious Emissions at Antenna Terminals Test Setup**



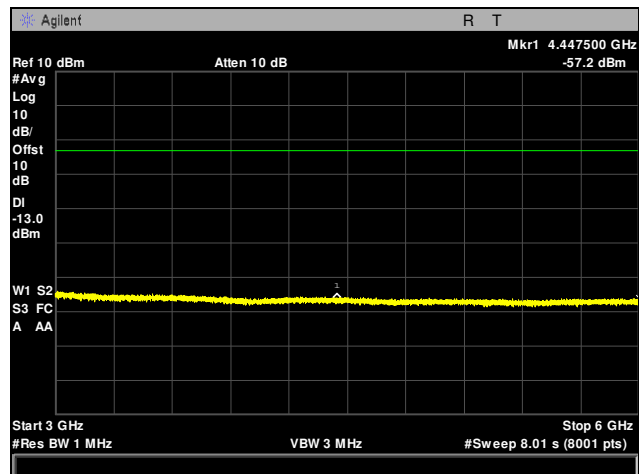
## Conducted Spurious Emissions, Beacon Radio



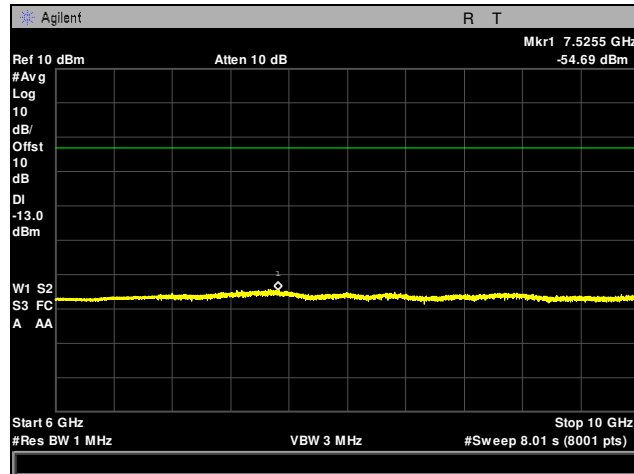
Plot 51. Conducted Spurious Emissions, Beacon Radio, Channel 640, 30 MHz – 1 GHz



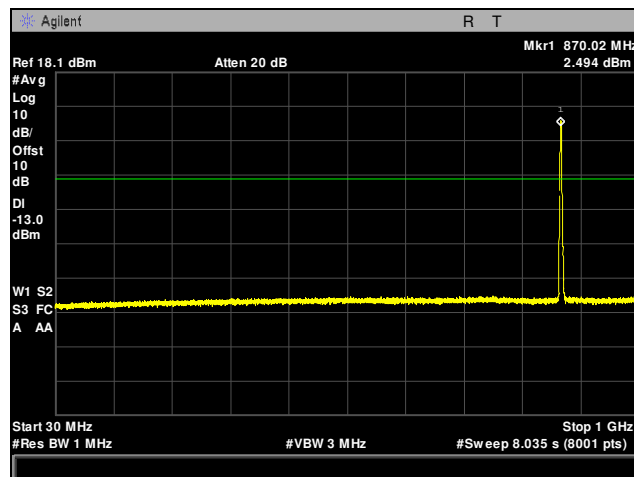
Plot 52. Conducted Spurious Emissions, Beacon Radio, Channel 640, 1 GHz – 3 GHz



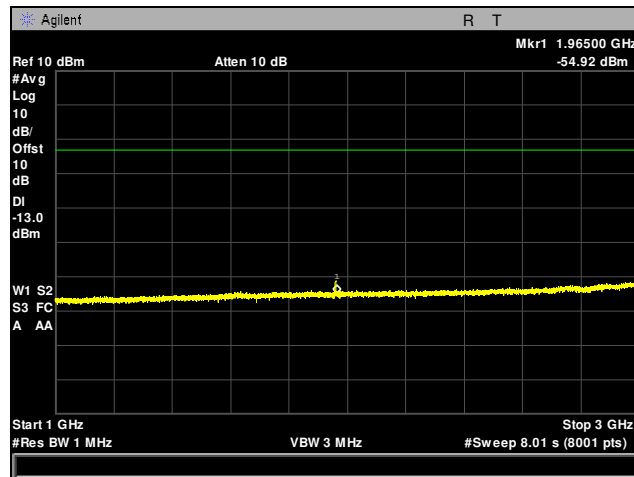
Plot 53. Conducted Spurious Emissions, Beacon Radio, Channel 640, 3 GHz – 6 GHz



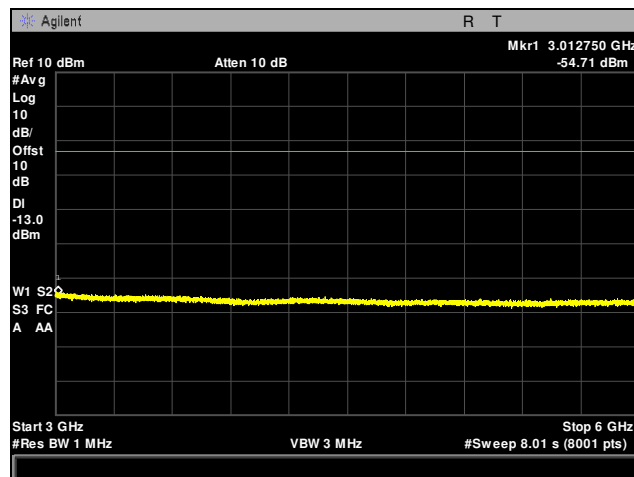
Plot 54. Conducted Spurious Emissions, Beacon Radio, Channel 640, 6 GHz – 10 GHz



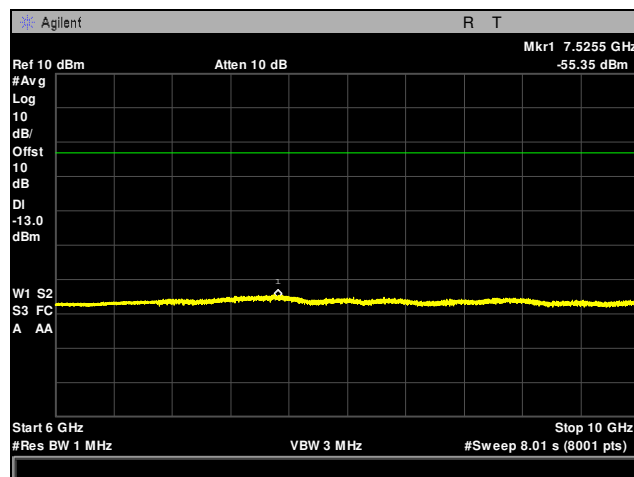
Plot 55. Conducted Spurious Emissions, Beacon Radio, Channel 779, 30 MHz – 1 GHz



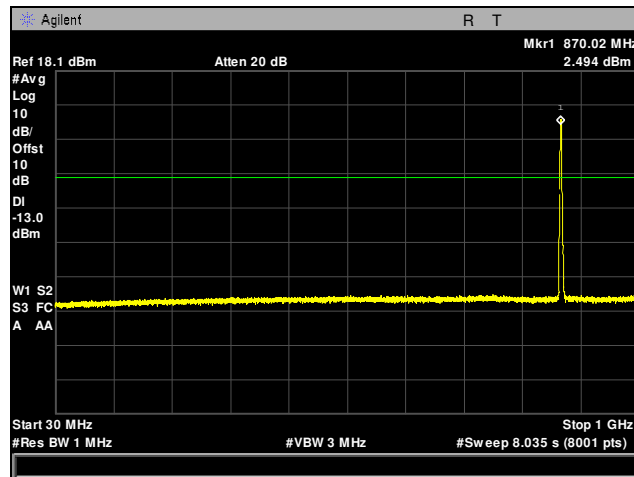
Plot 56. Conducted Spurious Emissions, Beacon Radio, Channel 779, 1 GHz – 3 GHz



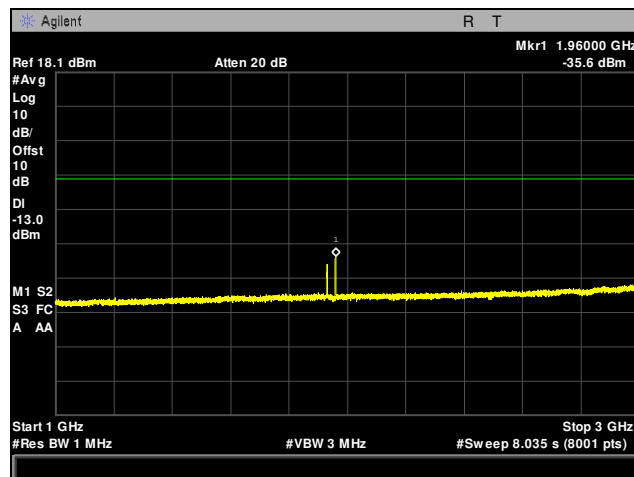
Plot 57. Conducted Spurious Emissions, Beacon Radio, Channel 779, 3 GHz – 6 GHz



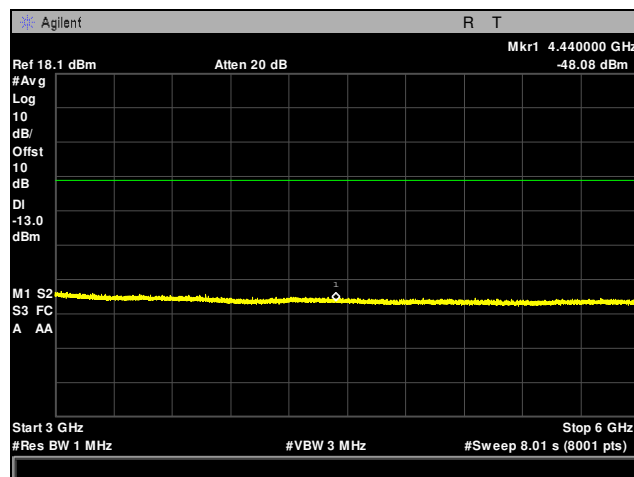
Plot 58. Conducted Spurious Emissions, Beacon Radio, Channel 779, 6 GHz – 10 GHz



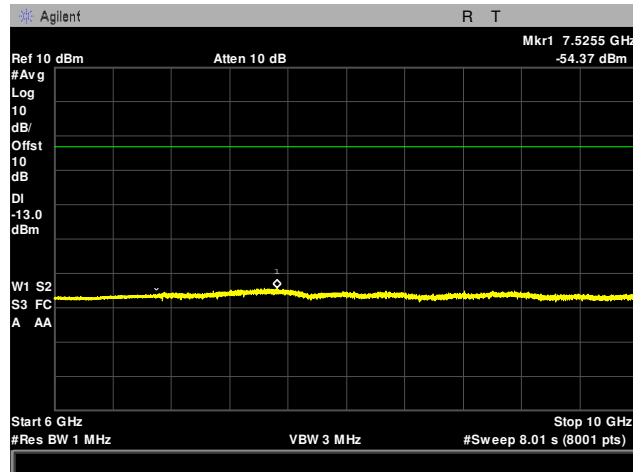
Plot 59. Conducted Spurious Emissions, Beacon Radio, Channel 991, 30 MHz – 1 GHz



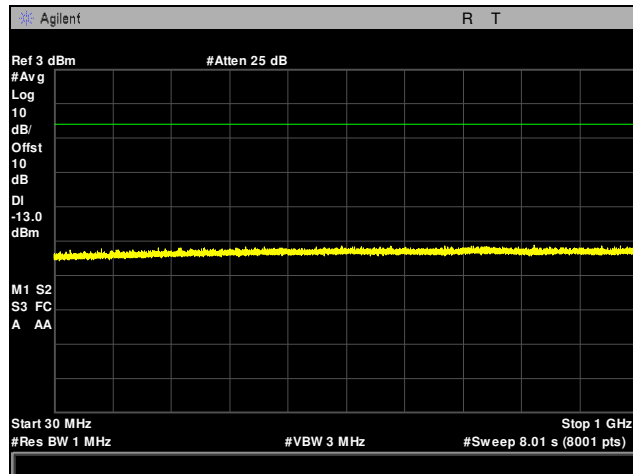
Plot 60. Conducted Spurious Emissions, Beacon Radio, Channel 991, 1 GHz – 3 GHz



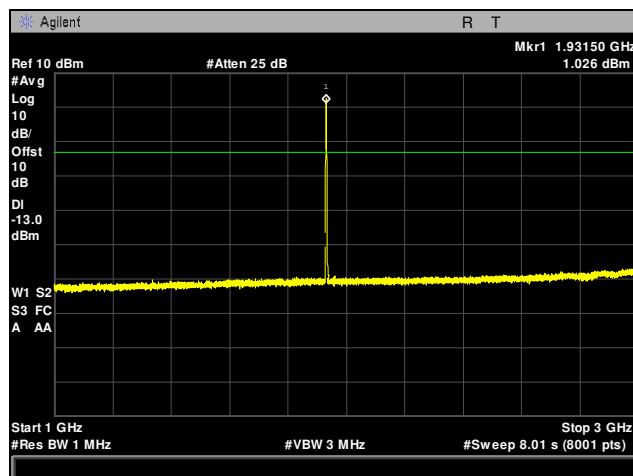
Plot 61. Conducted Spurious Emissions, Beacon Radio, Channel 991, 3 GHz – 6 GHz



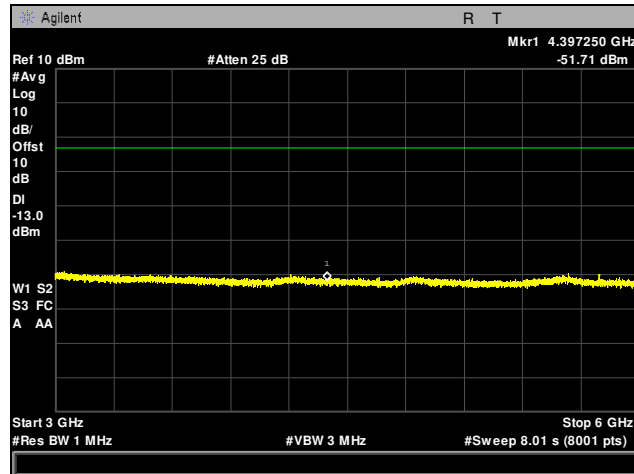
Plot 62. Conducted Spurious Emissions, Beacon Radio, Channel 991, 6 GHz – 10 GHz



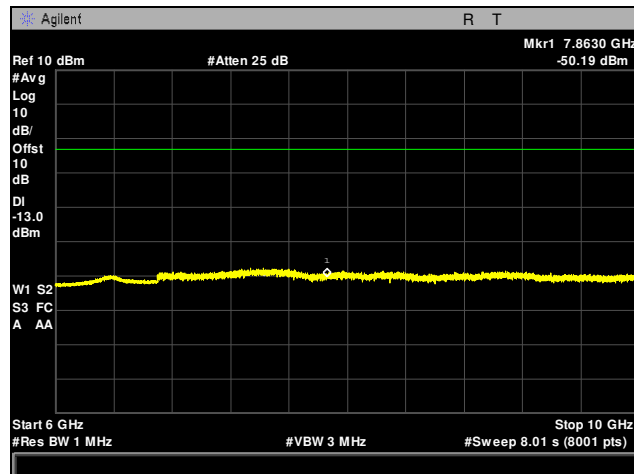
Plot 63. Conducted Spurious Emissions, Beacon Radio, Channel 25, 30 MHz – 1 GHz



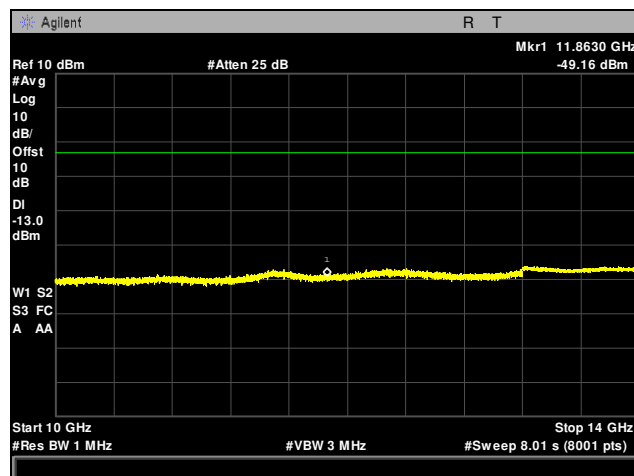
Plot 64. Conducted Spurious Emissions, Beacon Radio, Channel 25, 1 GHz – 3 GHz



Plot 65. Conducted Spurious Emissions, Beacon Radio, Channel 25, 3 GHz – 6 GHz

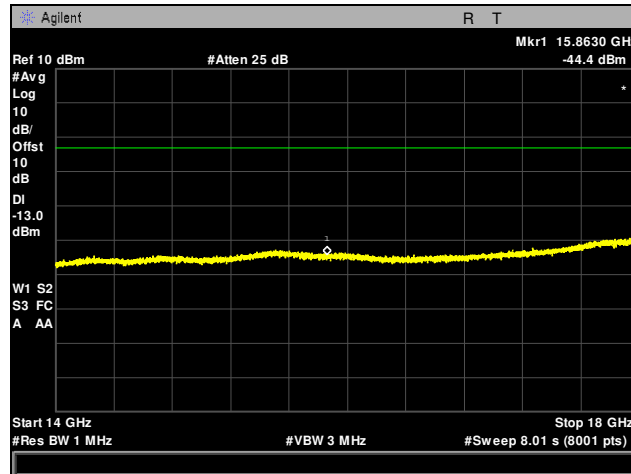


Plot 66. Conducted Spurious Emissions, Beacon Radio, Channel 25, 6 GHz – 10 GHz

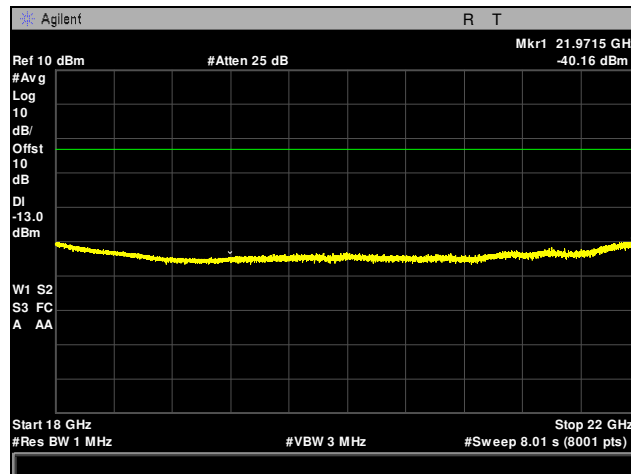


Plot 67. Conducted Spurious Emissions, Beacon Radio, Channel 25, 10 GHz – 14 GHz

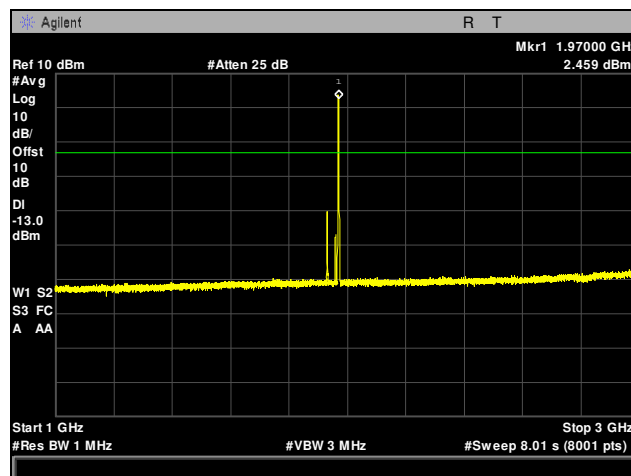




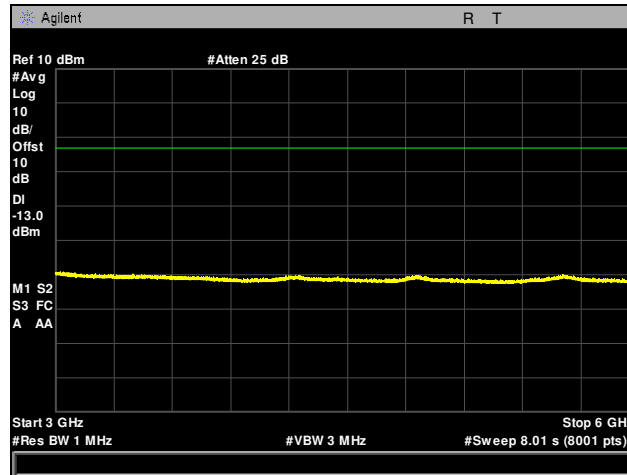
Plot 68. Conducted Spurious Emissions, Beacon Radio, Channel 25, 14 GHz – 18 GHz



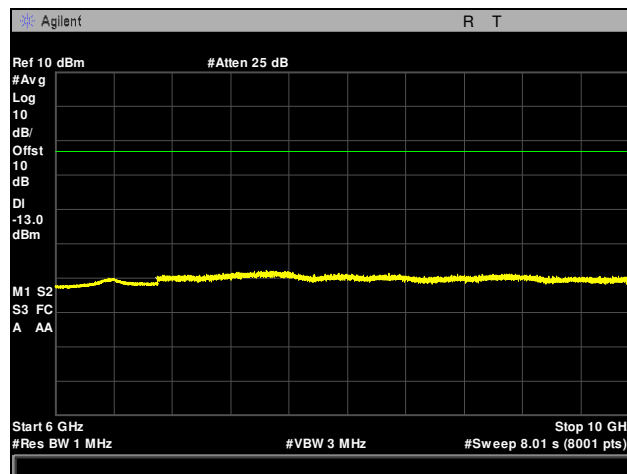
Plot 69. Conducted Spurious Emissions, Beacon Radio, Channel 25, 18 GHz – 22 GHz



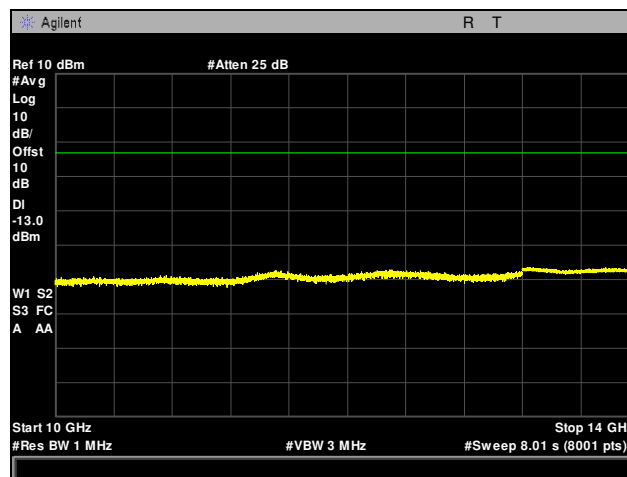
Plot 70. Conducted Spurious Emissions, Beacon Radio, Channel 600, 30 MHz – 1 GHz



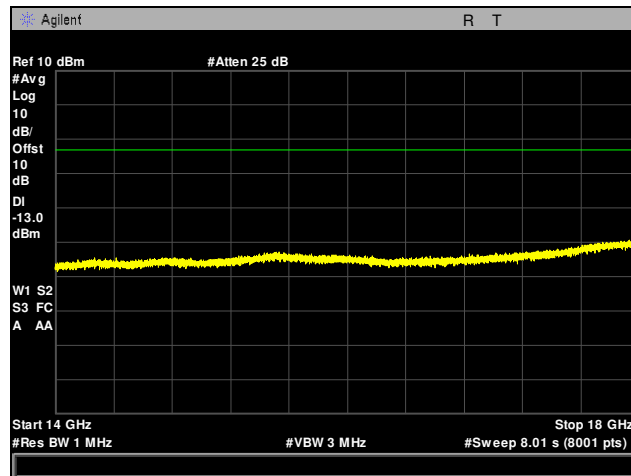
Plot 71. Conducted Spurious Emissions, Beacon Radio, Channel 600, 3 GHz – 6 GHz



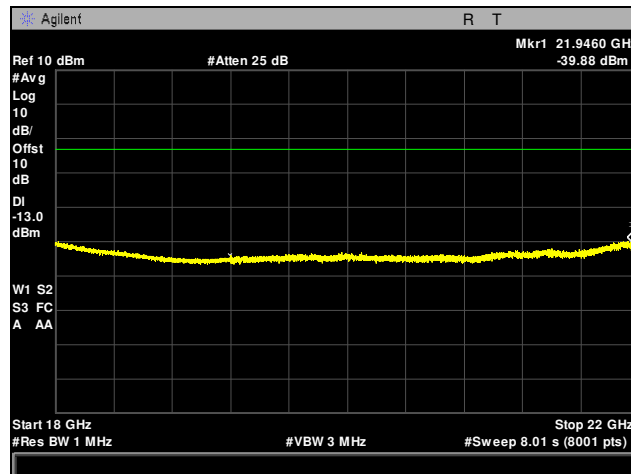
Plot 72. Conducted Spurious Emissions, Beacon Radio, Channel 600, 6 GHz – 10 GHz



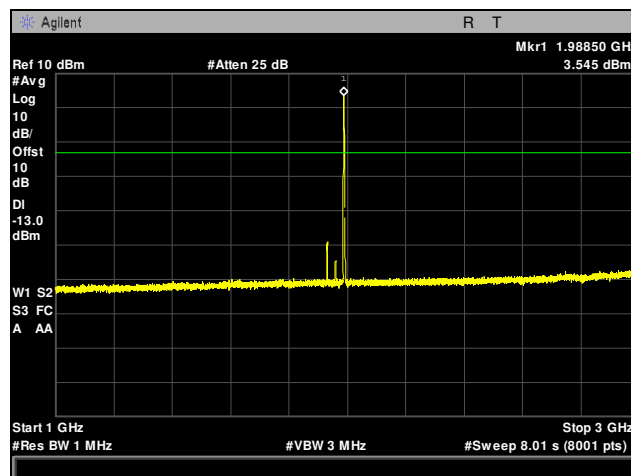
Plot 73. Conducted Spurious Emissions, Beacon Radio, Channel 600, 10 GHz – 14 GHz



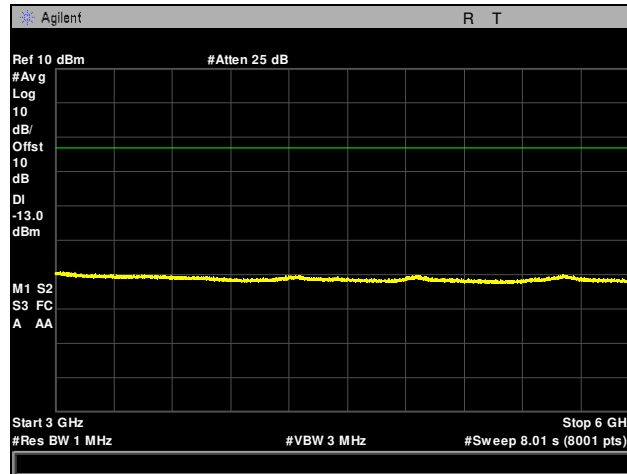
Plot 74. Conducted Spurious Emissions, Beacon Radio, Channel 600, 14 GHz – 18 GHz



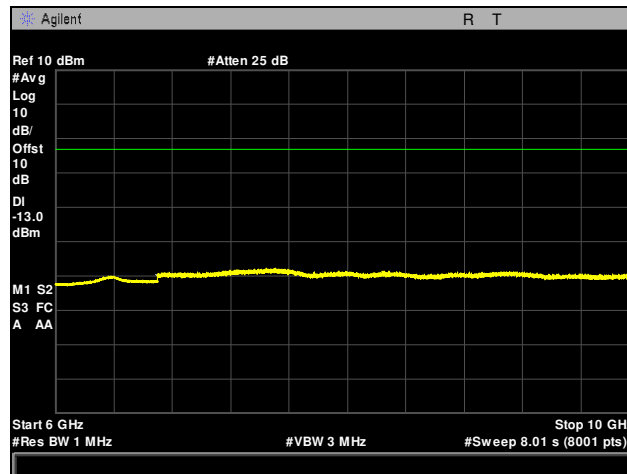
Plot 75. Conducted Spurious Emissions, Beacon Radio, Channel 600, 18 GHz – 22 GHz



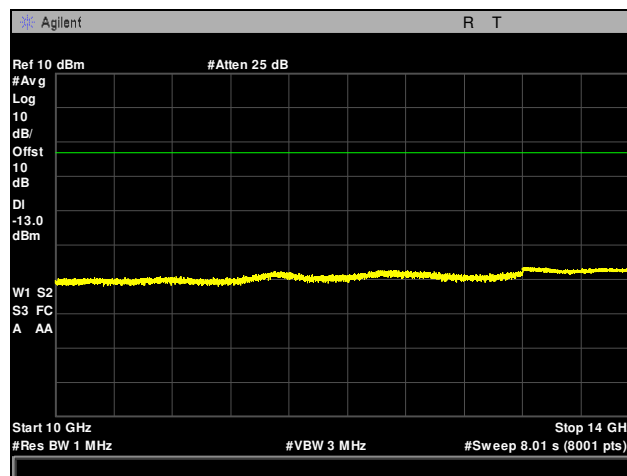
Plot 76. Conducted Spurious Emissions, Beacon Radio, Channel 1175, 30 MHz – 1 GHz



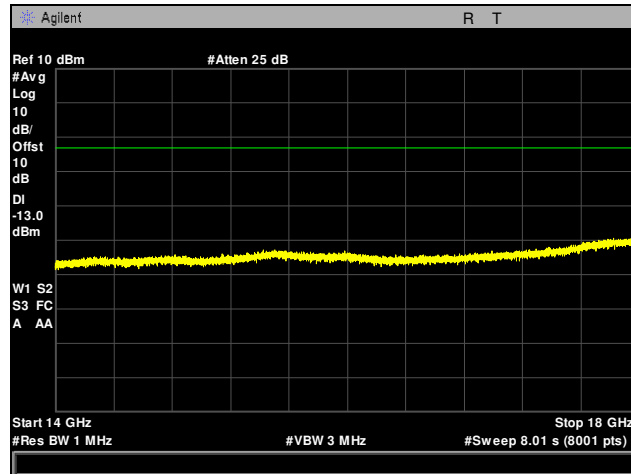
Plot 77. Conducted Spurious Emissions, Beacon Radio, Channel 1175, 3 GHz – 6 GHz



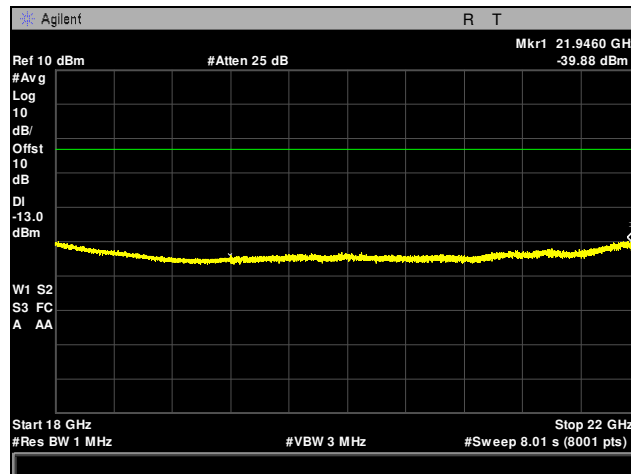
Plot 78. Conducted Spurious Emissions, Beacon Radio, Channel 1175, 6 GHz – 10 GHz



Plot 79. Conducted Spurious Emissions, Beacon Radio, Channel 1175, 10 GHz – 14 GHz

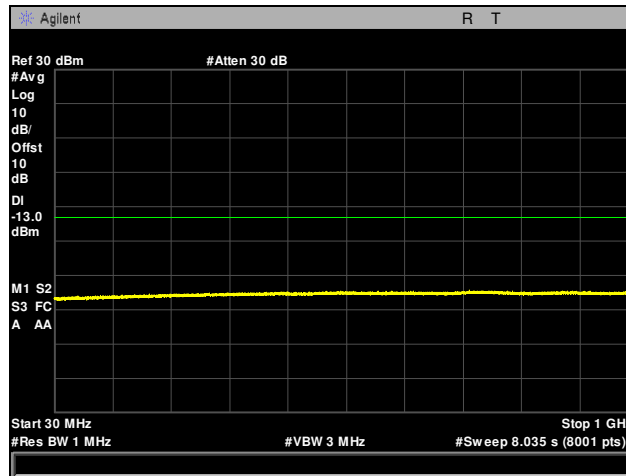


Plot 80. Conducted Spurious Emissions, Beacon Radio, Channel 1175, 14 GHz – 18 GHz

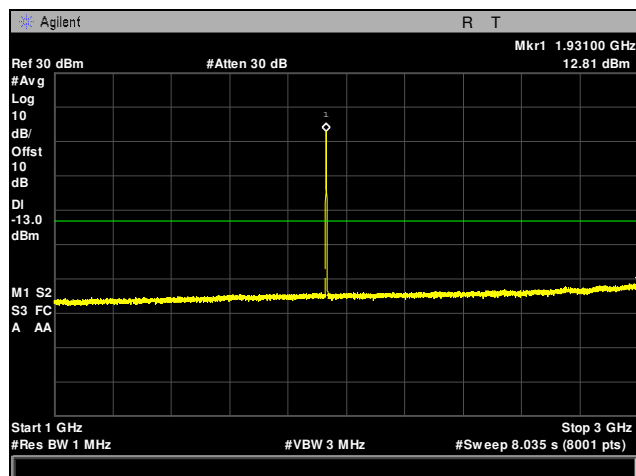


Plot 81. Conducted Spurious Emissions, Beacon Radio, Channel 1175, 18 GHz – 22 GHz

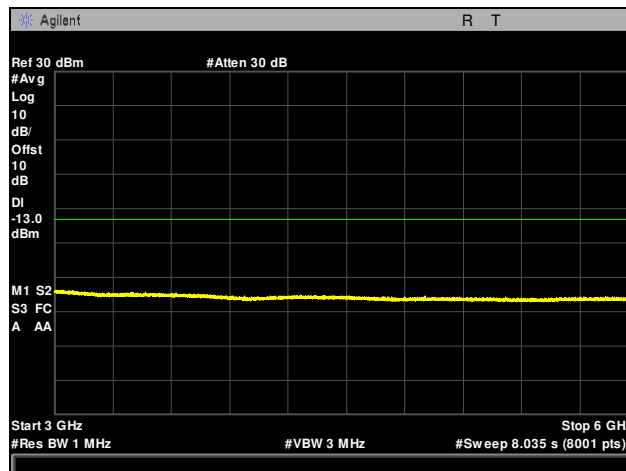
## Conducted Spurious Emissions, EVDO Radio



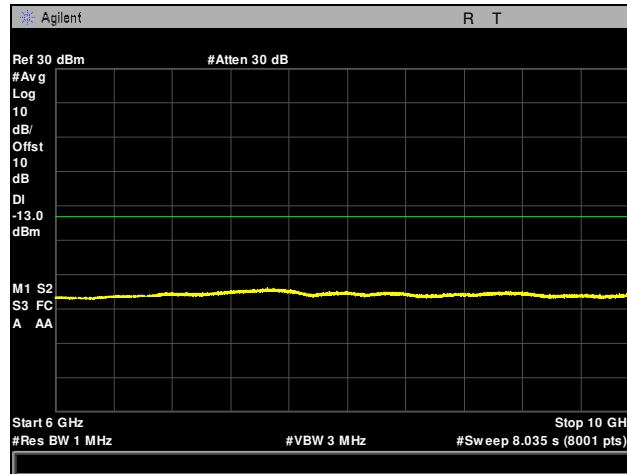
Plot 82. Conducted Spurious Emissions, EVDO Radio, Channel 25, 30 MHz – 1 GHz



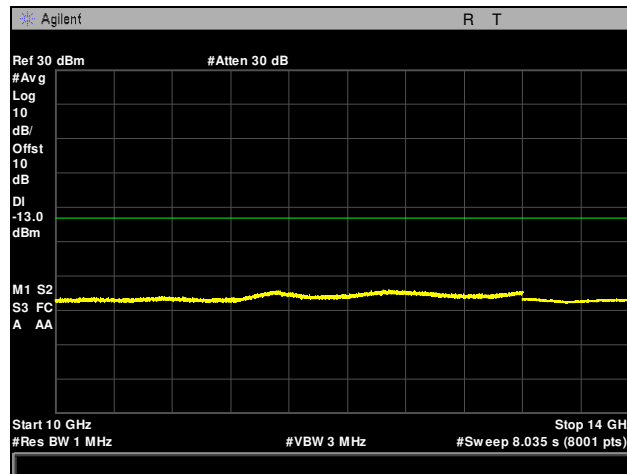
Plot 83. Conducted Spurious Emissions, EVDO Radio, Channel 25, 1 GHz – 3 GHz



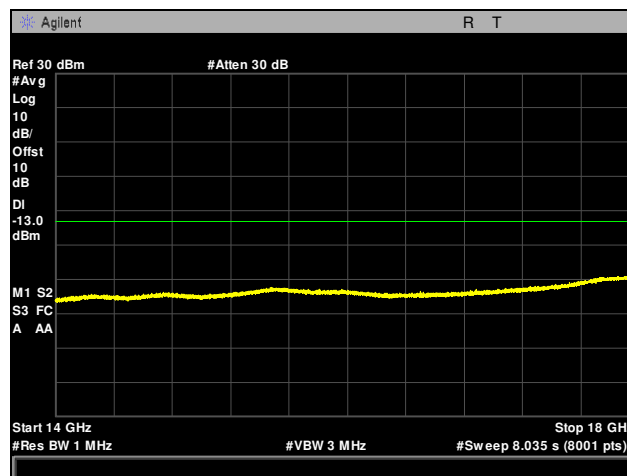
Plot 84. Conducted Spurious Emissions, EVDO Radio, Channel 25, 3 GHz – 6 GHz



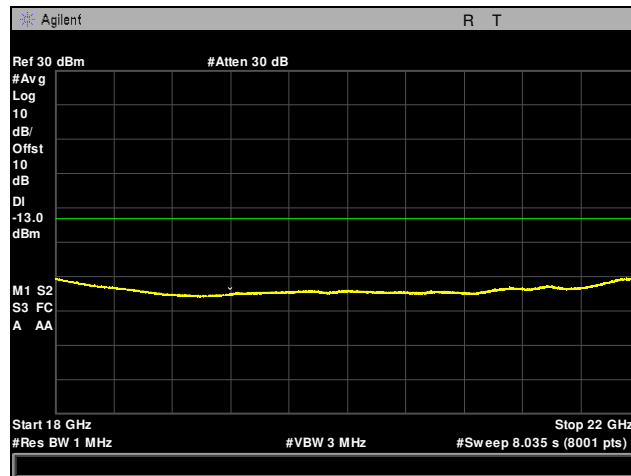
Plot 85. Conducted Spurious Emissions, EVDO Radio, Channel 25, 6 GHz – 10 GHz



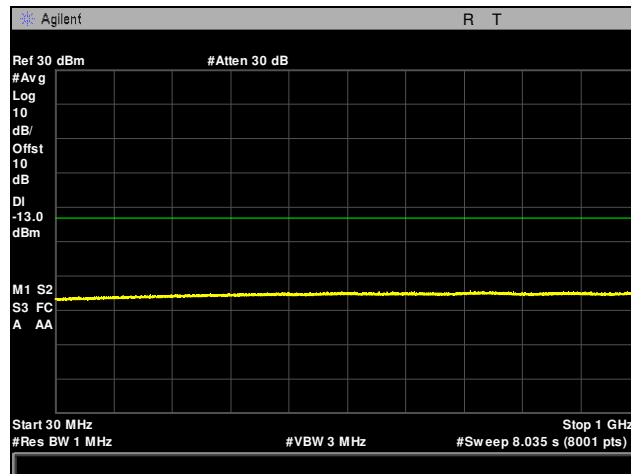
Plot 86. Conducted Spurious Emissions, EVDO Radio, Channel 25, 10 GHz – 14 GHz



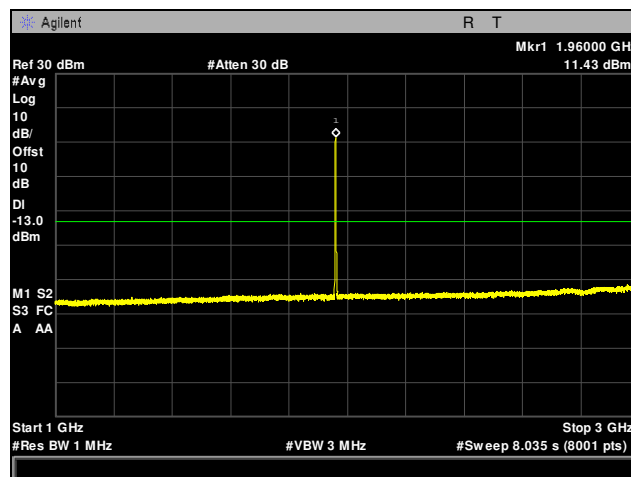
Plot 87. Conducted Spurious Emissions, EVDO Radio, Channel 25, 14 GHz – 18 GHz



Plot 88. Conducted Spurious Emissions, EVDO Radio, Channel 25, 18 GHz – 22 GHz

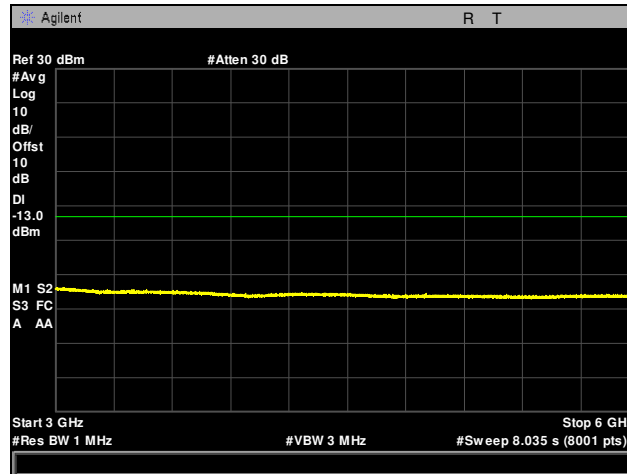


Plot 89. Conducted Spurious Emissions, EVDO Radio, Channel 600, 30 MHz – 1 GHz

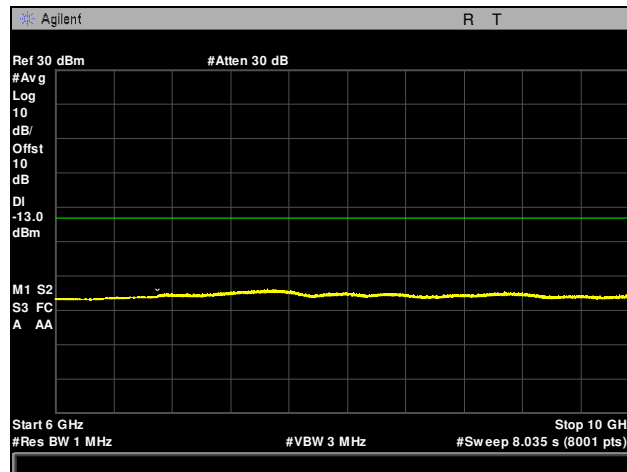


Plot 90. Conducted Spurious Emissions, EVDO Radio, Channel 600, 1 GHz – 3 GHz

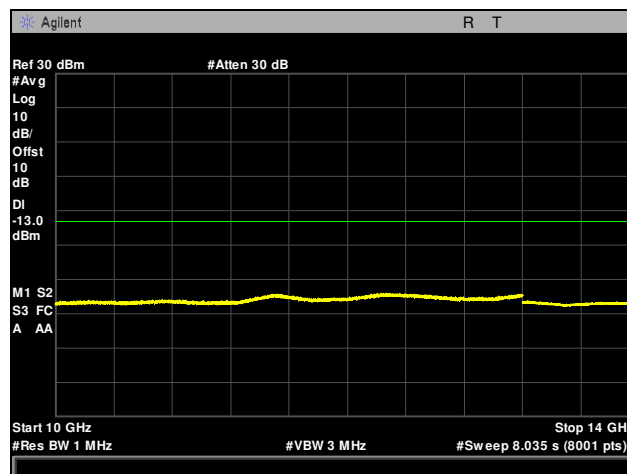




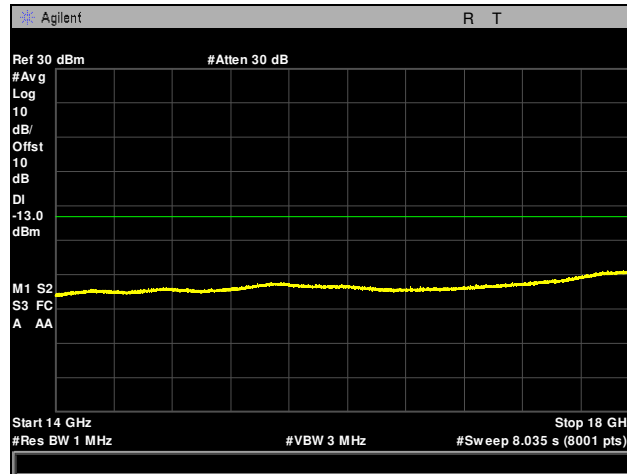
Plot 91. Conducted Spurious Emissions, EVDO Radio, Channel 600, 3 GHz – 6 GHz



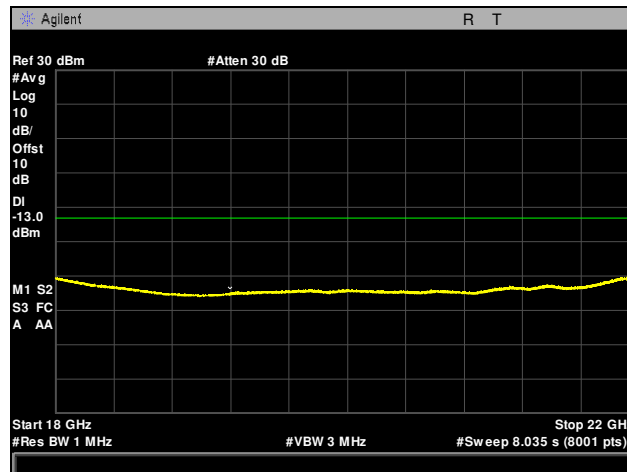
Plot 92. Conducted Spurious Emissions, EVDO Radio, Channel 600, 6 GHz – 10 GHz



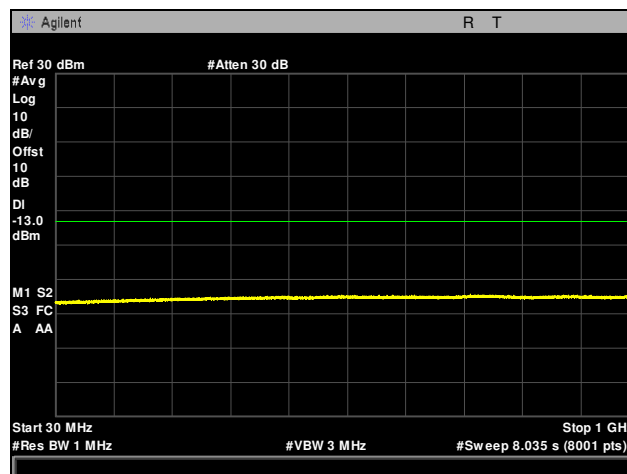
Plot 93. Conducted Spurious Emissions, EVDO Radio, Channel 600, 10 GHz – 14 GHz



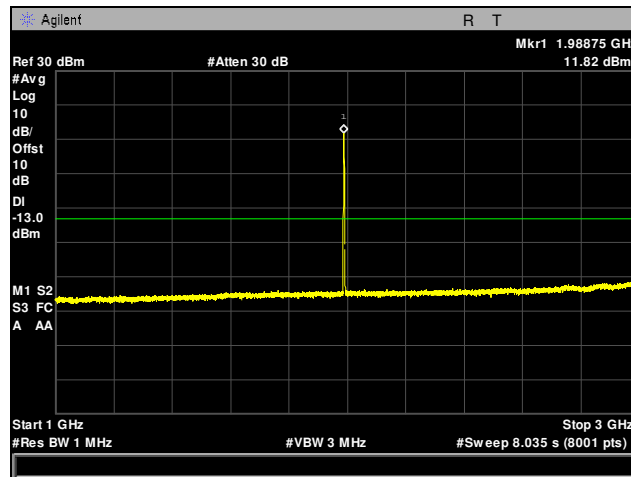
Plot 94. Conducted Spurious Emissions, EVDO Radio, Channel 600, 14 GHz – 18 GHz



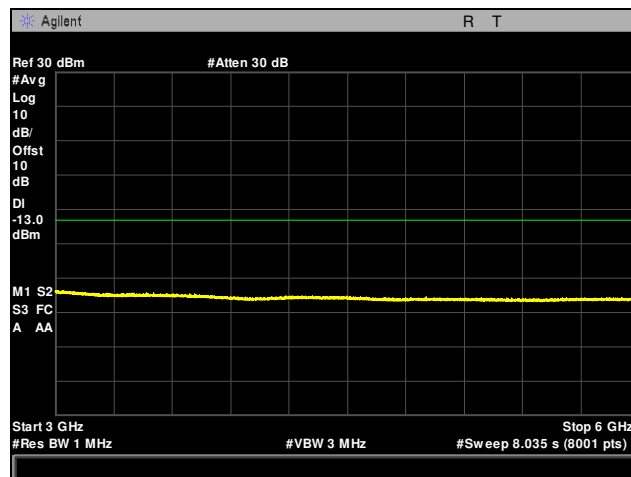
Plot 95. Conducted Spurious Emissions, EVDO Radio, Channel 600, 18 GHz – 22 GHz



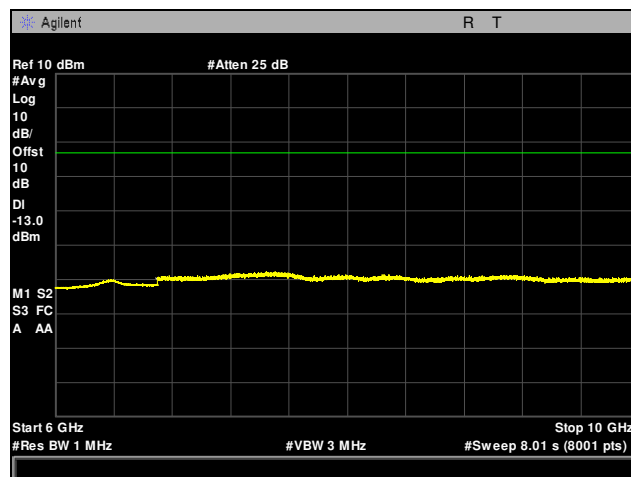
Plot 96. Conducted Spurious Emissions, EVDO Radio, Channel 1175, 30 MHz – 1 GHz



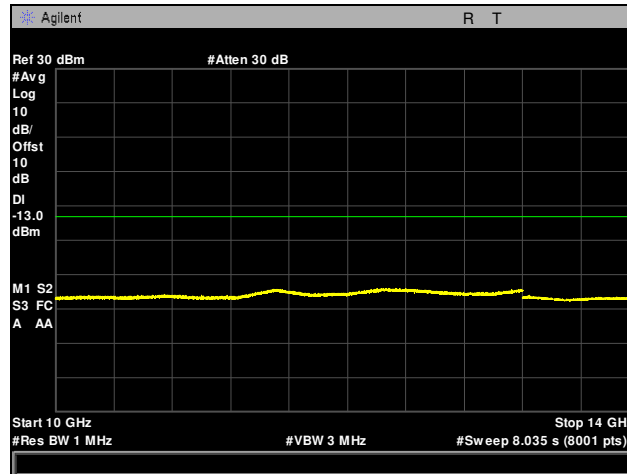
Plot 97. Conducted Spurious Emissions, EVDO Radio, Channel 1175, 1 GHz – 3 GHz



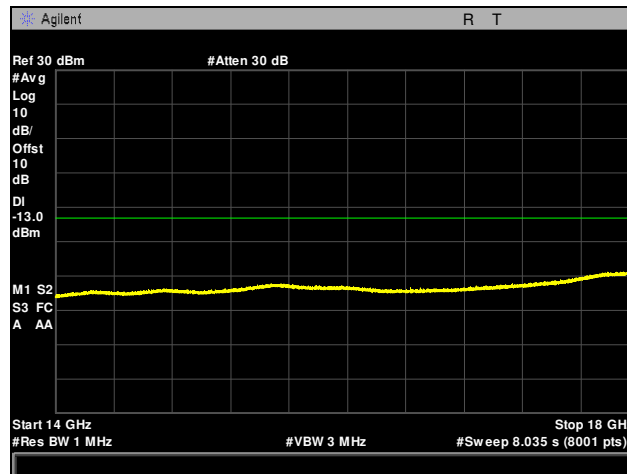
Plot 98. Conducted Spurious Emissions, EVDO Radio, Channel 1175, 3 GHz – 6 GHz



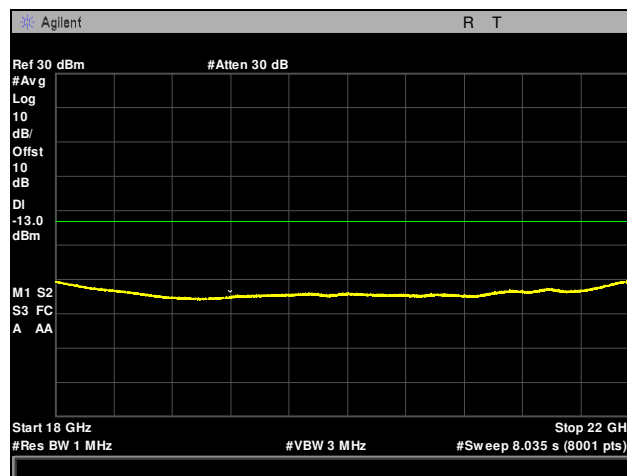
Plot 99. Conducted Spurious Emissions, EVDO Radio, Channel 1175, 6 GHz – 10 GHz



Plot 100. Conducted Spurious Emissions, EVDO Radio, Channel 1175, 10 GHz – 14 GHz

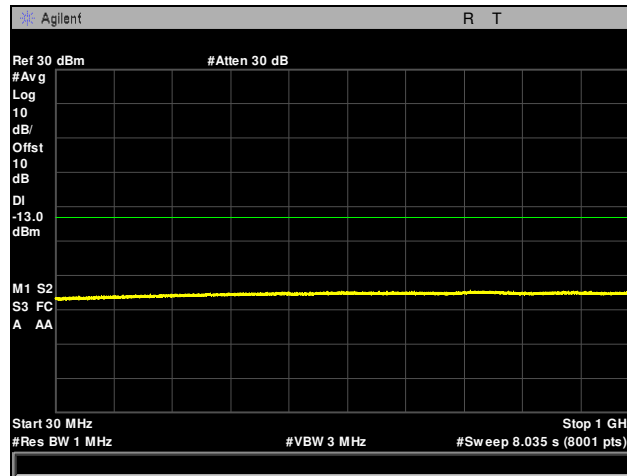


Plot 101. Conducted Spurious Emissions, EVDO Radio, Channel 1175, 14 GHz – 18 GHz

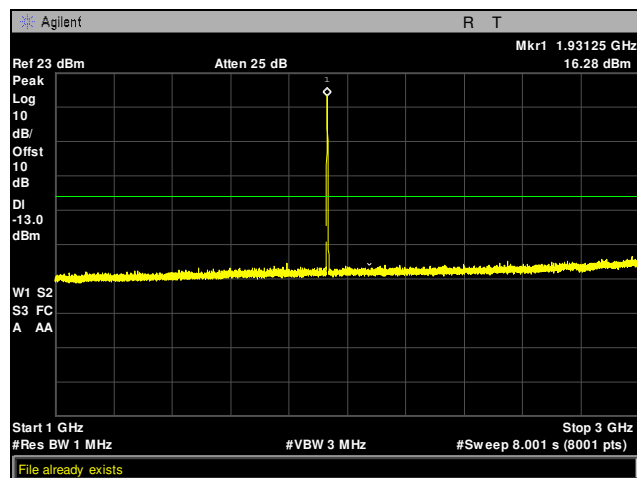


Plot 102. Conducted Spurious Emissions, EVDO Radio, Channel 1175, 18 GHz – 22 GHz

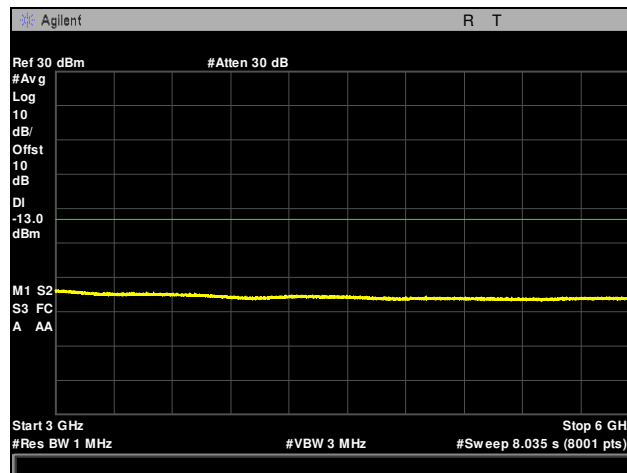
## Conducted Spurious Emissions, OneX Radio



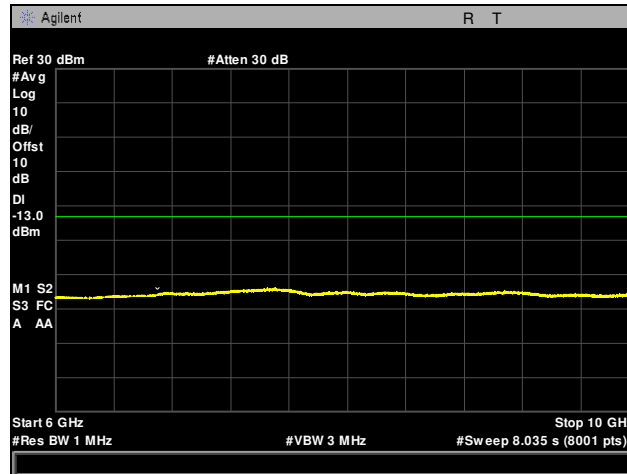
Plot 103. Conducted Spurious Emissions, OneX Radio, Channel 25, 30 MHz – 1 GHz



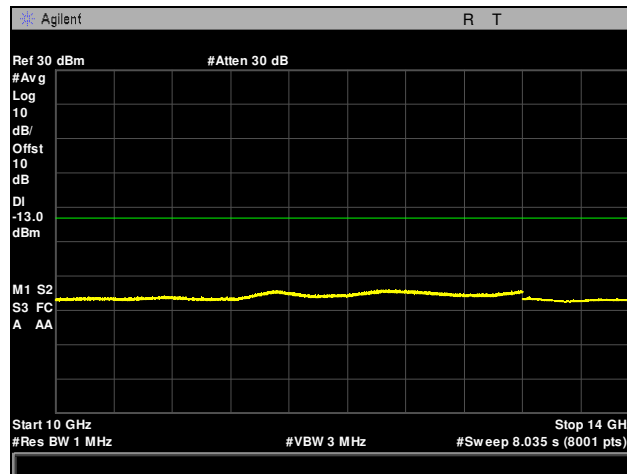
Plot 104. Conducted Spurious Emissions, OneX Radio, Channel 25, 1 GHz – 3 GHz



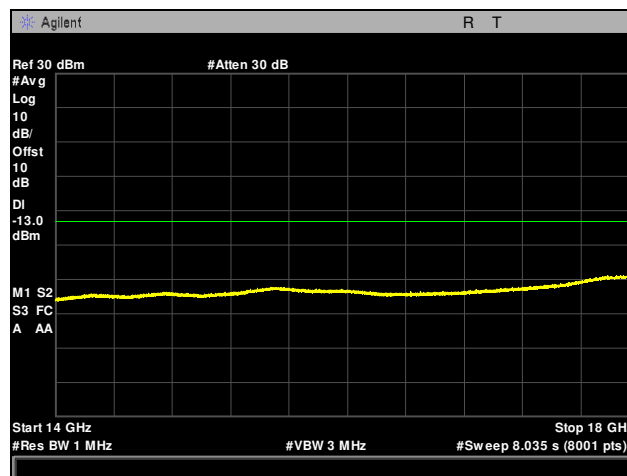
Plot 105. Conducted Spurious Emissions, OneX Radio, Channel 25, 3 GHz – 6 GHz



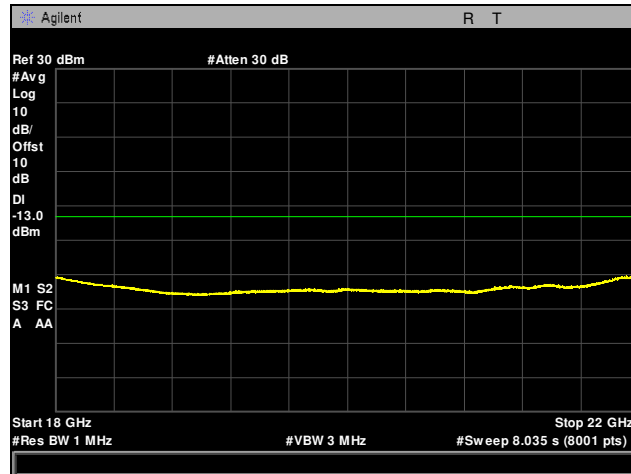
Plot 106. Conducted Spurious Emissions, OneX Radio, Channel 25, 6 GHz – 10 GHz



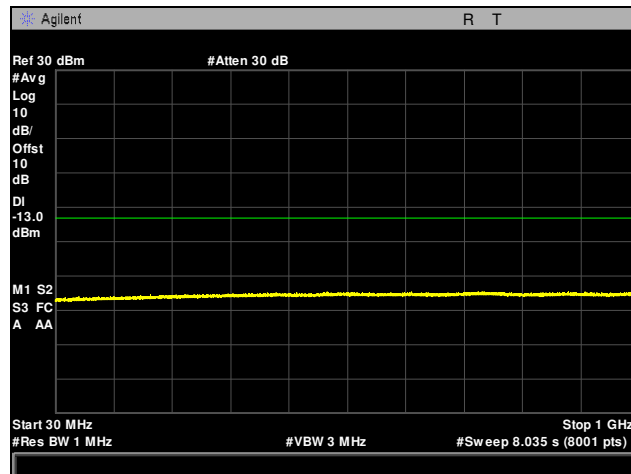
Plot 107. Conducted Spurious Emissions, OneX Radio, Channel 25, 10 GHz – 14 GHz



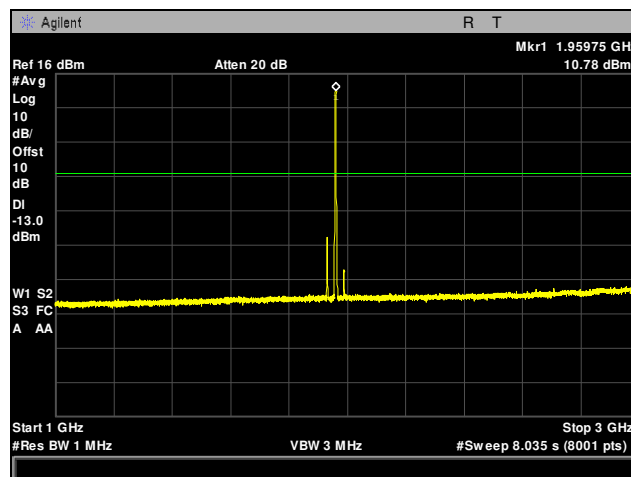
Plot 108. Conducted Spurious Emissions, OneX Radio, Channel 25, 14 GHz – 18 GHz



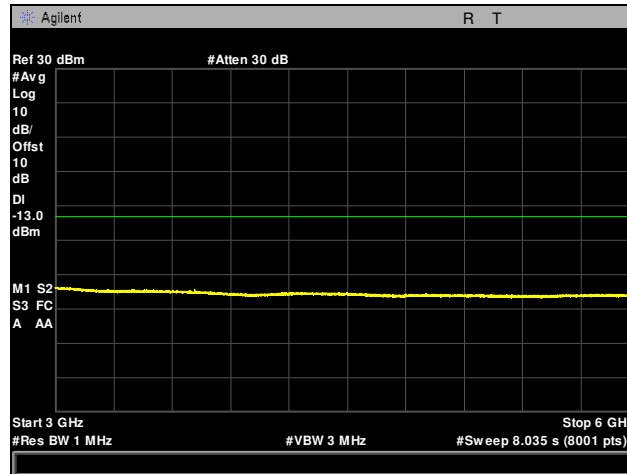
Plot 109. Conducted Spurious Emissions, OneX Radio, Channel 25, 18 GHz – 22 GHz



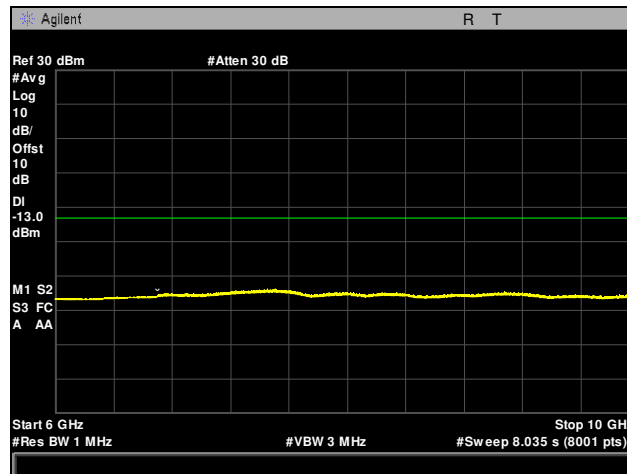
Plot 110. Conducted Spurious Emissions, OneX Radio, Channel 600, 30 MHz – 1 GHz



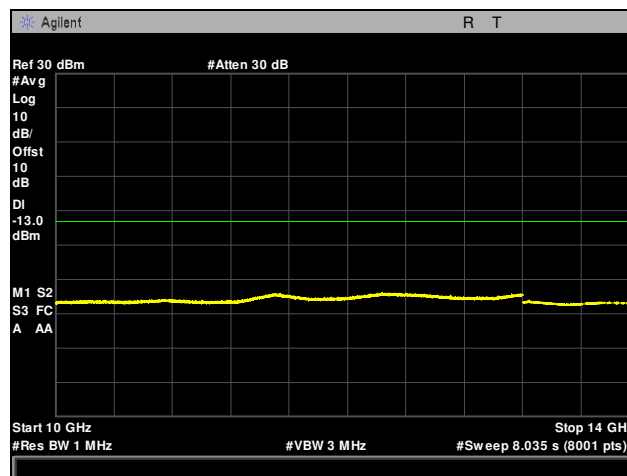
Plot 111. Conducted Spurious Emissions, OneX Radio, Channel 600, 1 GHz – 3 GHz



Plot 112. Conducted Spurious Emissions, OneX Radio, Channel 600, 3 GHz – 6 GHz

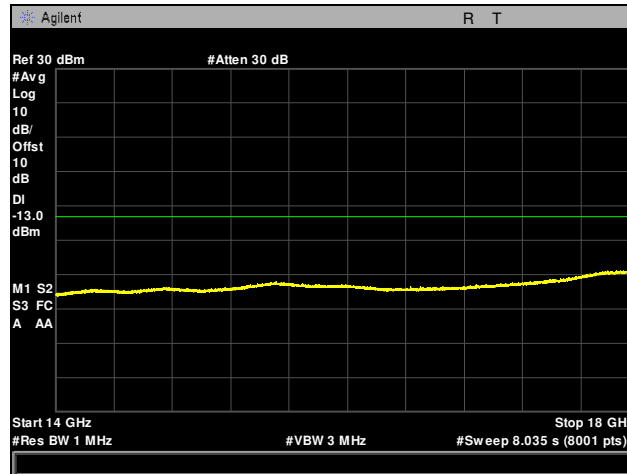


Plot 113. Conducted Spurious Emissions, OneX Radio, Channel 600, 6 GHz – 10 GHz

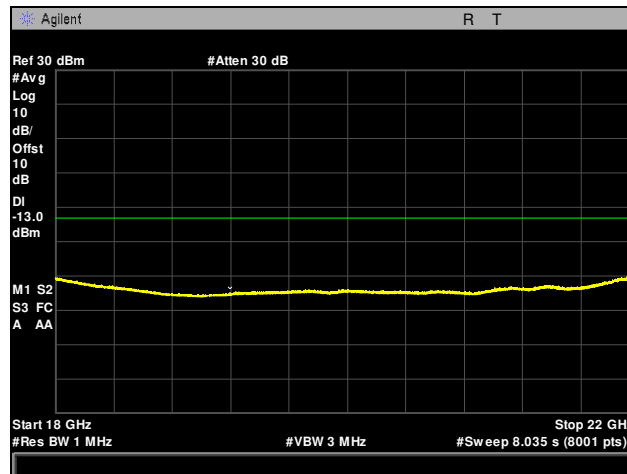


Plot 114. Conducted Spurious Emissions, OneX Radio, Channel 600, 10 GHz – 14 GHz

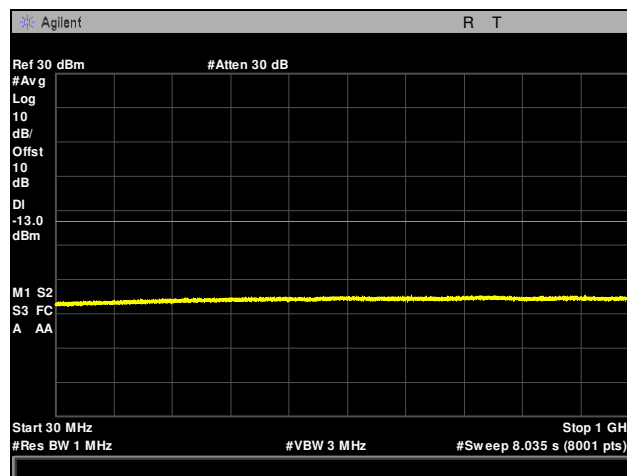




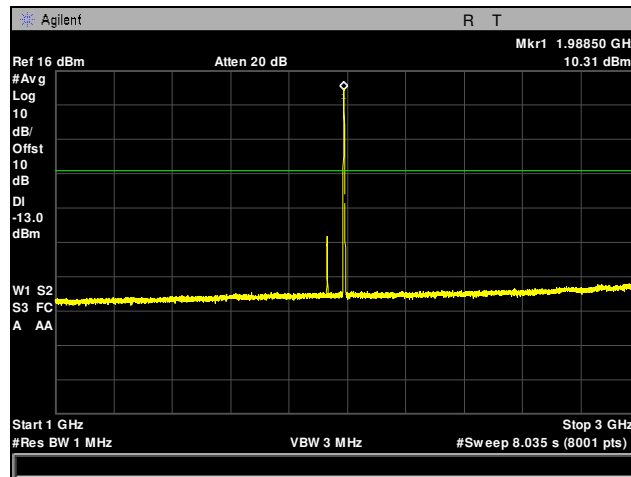
Plot 115. Conducted Spurious Emissions, OneX Radio, Channel 600, 14 GHz – 18 GHz



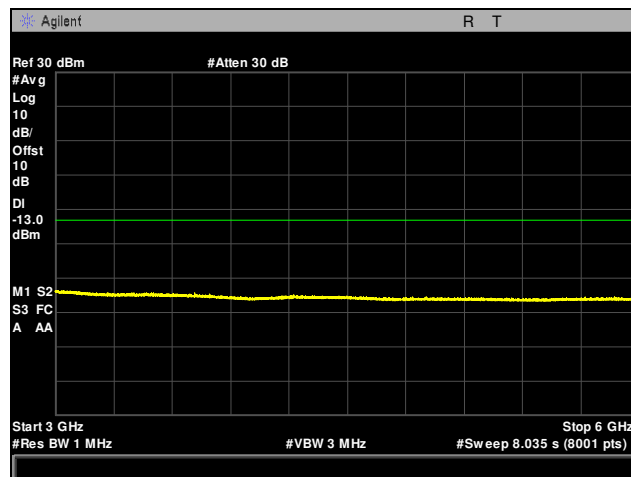
Plot 116. Conducted Spurious Emissions, OneX Radio, Channel 600, 18 GHz – 22 GHz



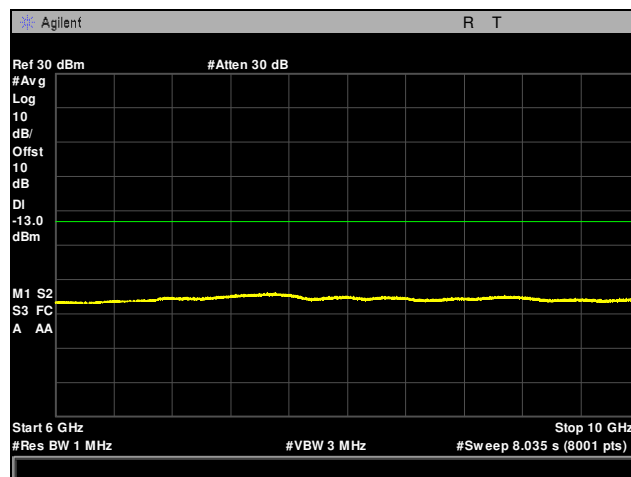
Plot 117. Conducted Spurious Emissions, OneX Radio, Channel 1175, 30 MHz – 1 GHz



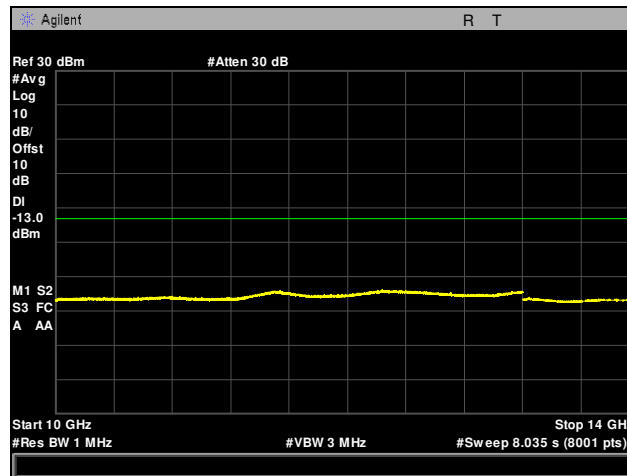
Plot 118. Conducted Spurious Emissions, OneX Radio, Channel 1175, 1 GHz – 3 GHz



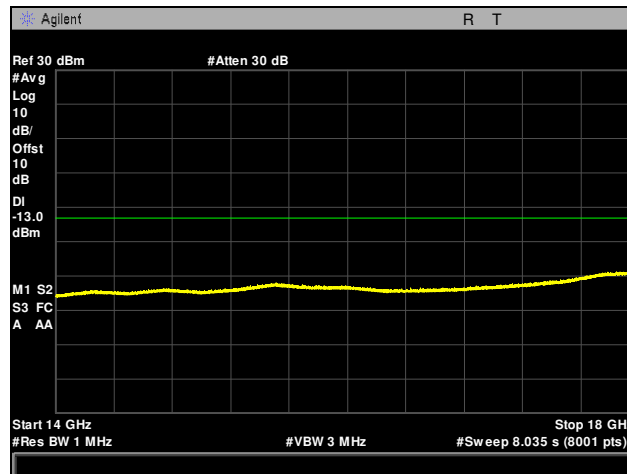
Plot 119. Conducted Spurious Emissions, OneX Radio, Channel 1175, 3 GHz – 6 GHz



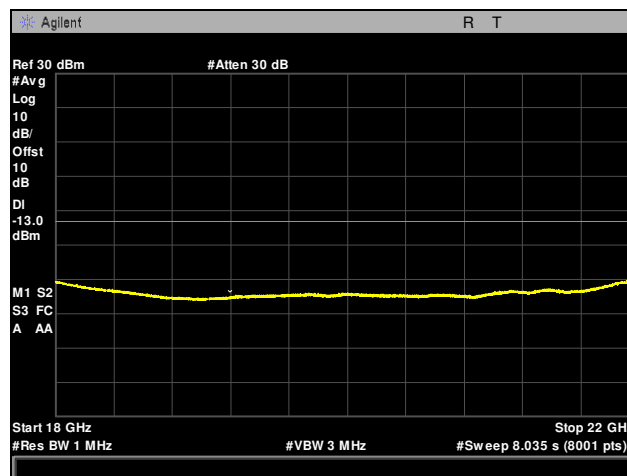
Plot 120. Conducted Spurious Emissions, OneX Radio, Channel 1175, 6 GHz – 10 GHz



Plot 121. Conducted Spurious Emissions, OneX Radio, Channel 1175, 10 GHz – 14 GHz



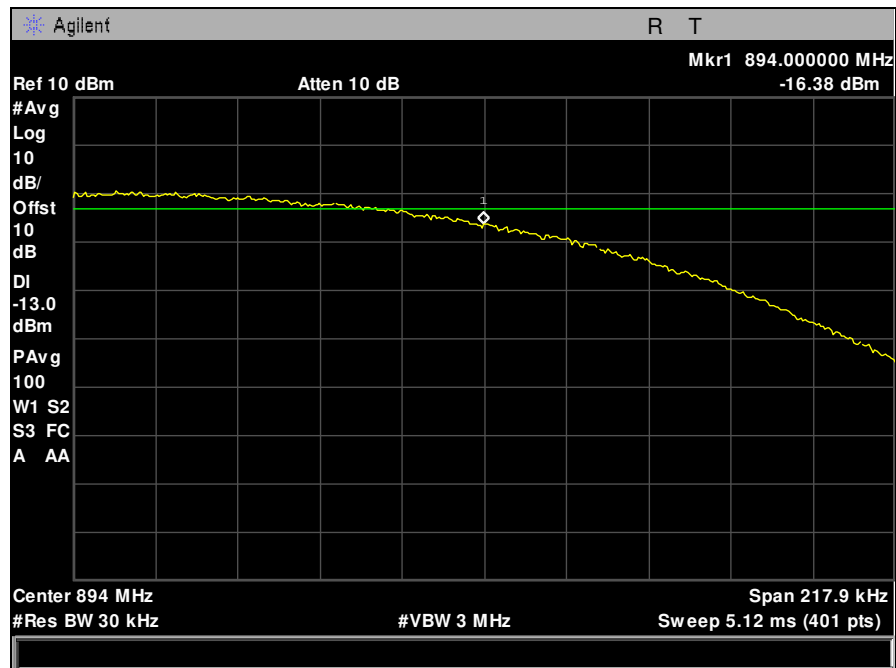
Plot 122. Conducted Spurious Emissions, OneX Radio, Channel 1175, 14 GHz – 18 GHz



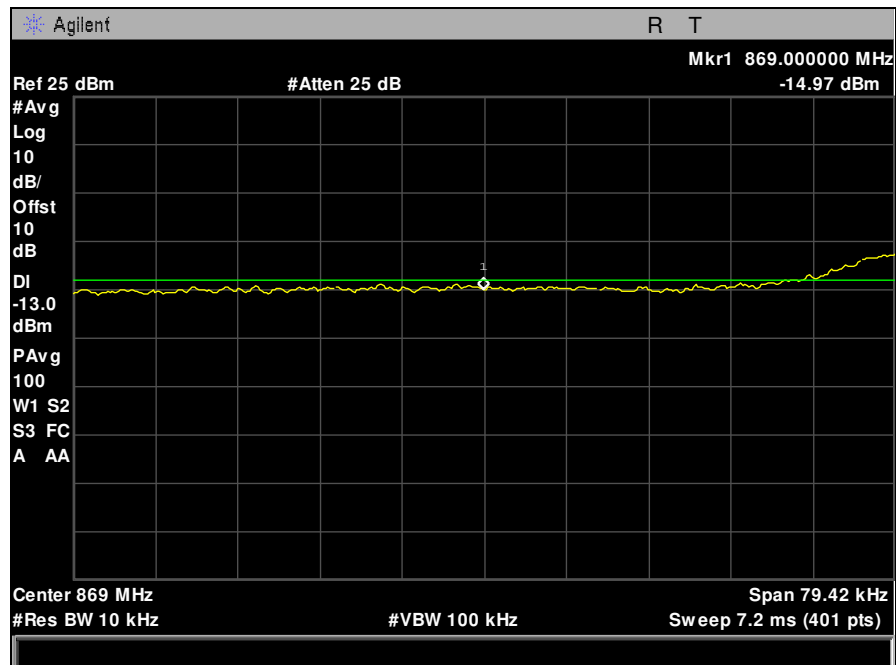
Plot 123. Conducted Spurious Emissions, OneX Radio, Channel 1175, 18 GHz – 22 GHz



## Band Edge, Beacon Radio



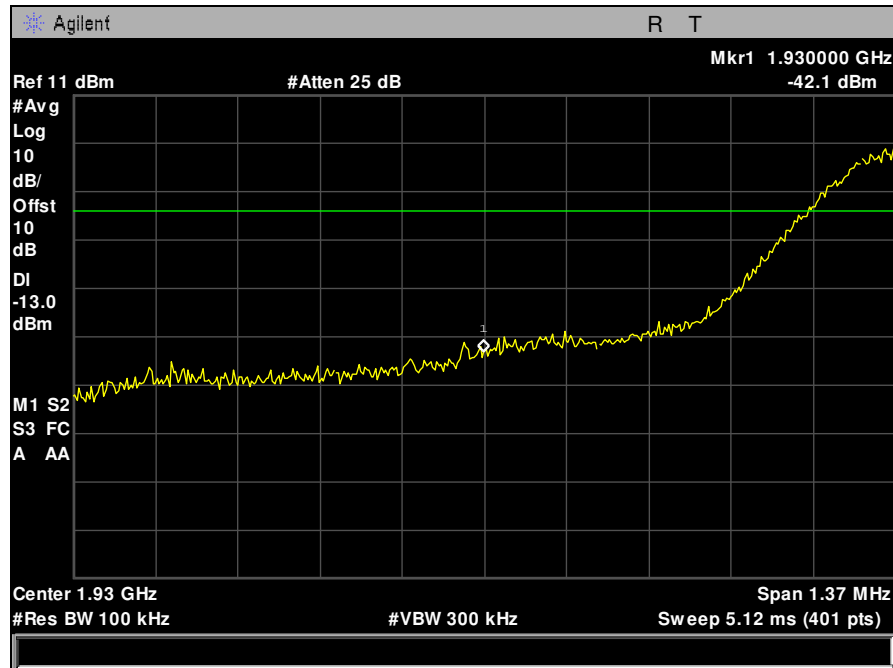
Plot 124. Conducted Band Edge, Beacon Radio, Channel 779



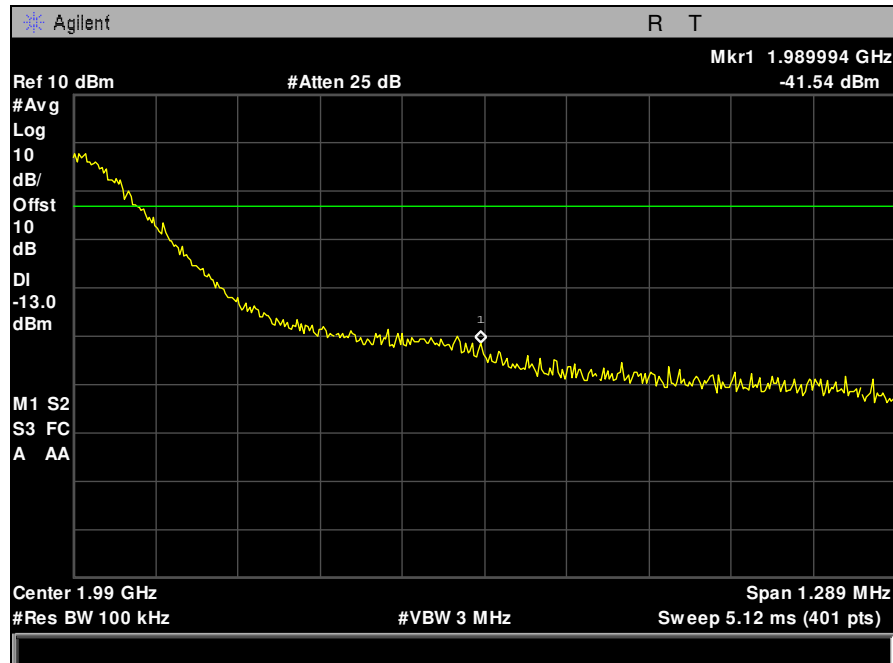
Plot 125. Conducted Band Edge, Beacon Radio, Channel 991



## Band Edge, Beacon Radio, BC1



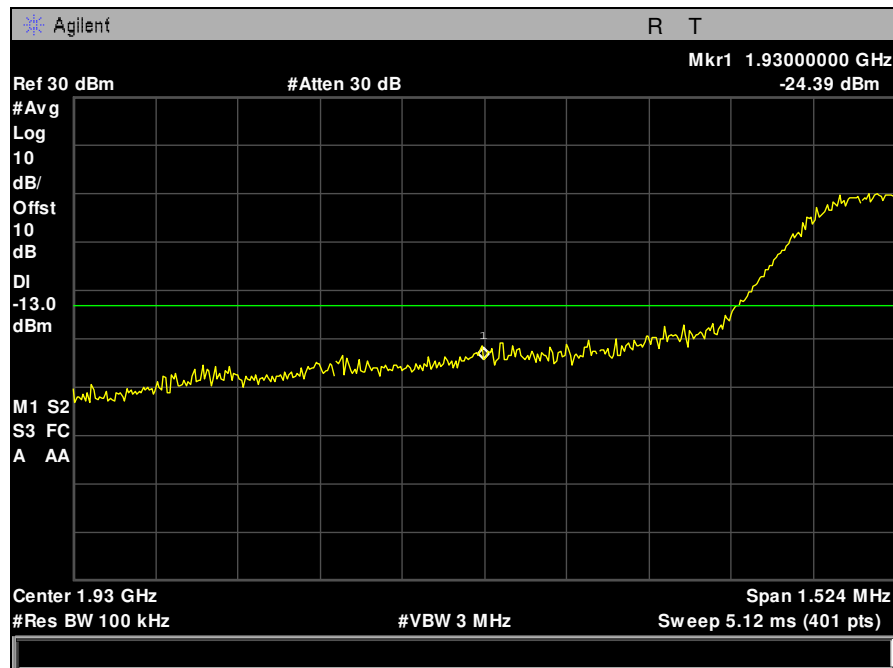
Plot 126. Conducted Band Edge, Beacon Radio, BC1, Channel 25



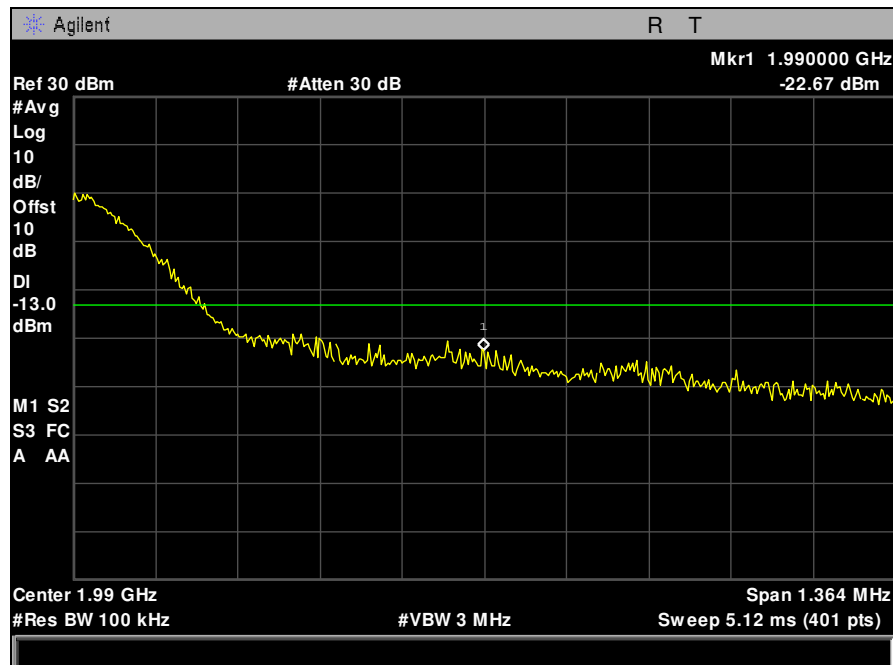
Plot 127. Conducted Band Edge, Beacon Radio, BC1, Channel 1175



## Band Edge, EVDO Radio, BC1

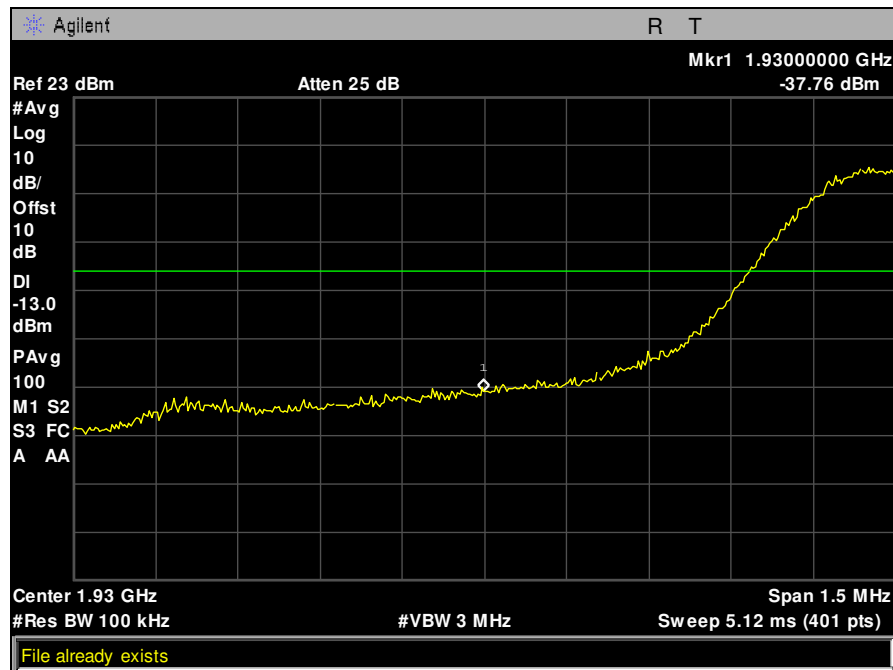


Plot 128. Conducted Band Edge, EVDO Radio, BC1, Channel 25

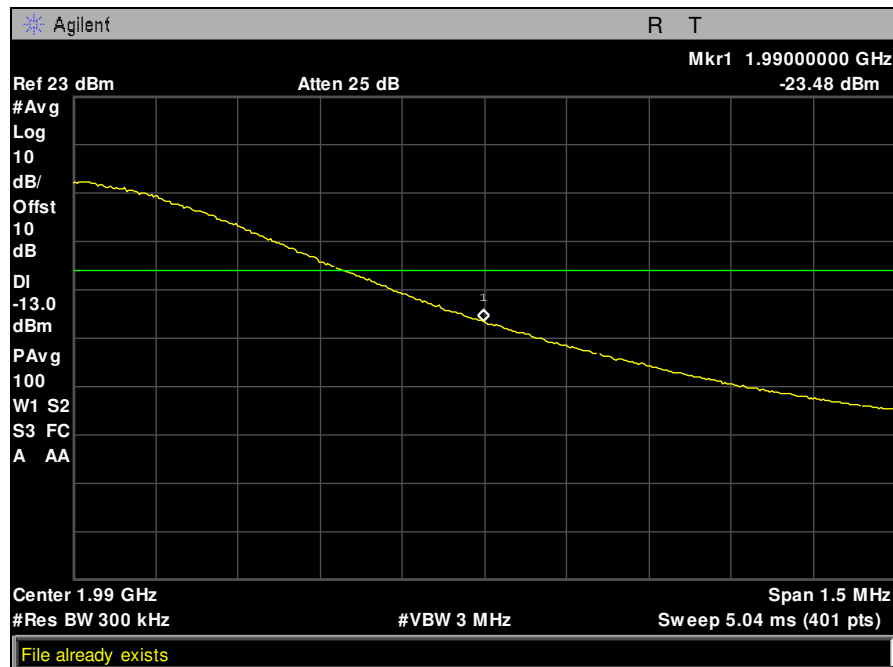


Plot 129. Conducted Band Edge, EVDO Radio, BC1, Channel 1175

## Band Edge, OneX Radio, BC1



Plot 130. Conducted Band Edge, OneX Radio, BC1, Channel 25



Plot 131. Conducted Band Edge, OneX Radio, BC1, Channel 1175



## Electromagnetic Compatibility Criteria for Intentional Radiators

### § 24.232(d) Peak to Average Ratio

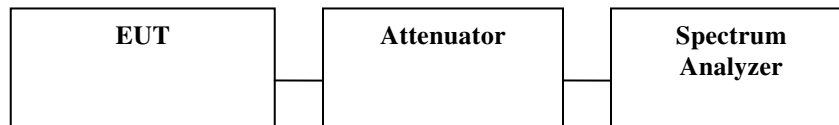
**Test Requirement(s):** § 24.232(d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ration (PAR) of the transmission may not exceed 13 dB.

**Test Procedures:**

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

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

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



**Figure 4. Spurious Emissions at Antenna Terminals Test Setup**





| Beacon Radio |                    | BC0              |      |       |        |
|--------------|--------------------|------------------|------|-------|--------|
| Channel      | Average Power(dBm) | Peak Power (dBm) | PAR  | Limit | Margin |
| Low          | 4.95               | 9.44             | 4.49 | 13    | 8.51   |
| Mid          | 5.68               | 9.83             | 4.15 | 13    | 8.85   |
| High         | 5.38               | 9.57             | 4.19 | 13    | 8.81   |

Table 5. Peak to Average Ratio, Test Results, Beacon Radio, BC0

| Beacon Radio |                    | BC1              |      |       |        |
|--------------|--------------------|------------------|------|-------|--------|
| Channel      | Average Power(dBm) | Peak Power (dBm) | PAR  | Limit | Margin |
| Low          | 3.65               | 8.36             | 4.71 | 13    | 8.29   |
| Mid          | 3.85               | 9.38             | 5.53 | 13    | 7.47   |
| High         | 4.49               | 8.74             | 4.25 | 13    | 8.75   |

Table 6. Peak to Average Ratio, Test Results, Beacon Radio, BC1

| EVDO Radio |                    | BC1              |      |       |        |
|------------|--------------------|------------------|------|-------|--------|
| Channel    | Average Power(dBm) | Peak Power (dBm) | PAR  | Limit | Margin |
| Low        | 13.45              | 18.95            | 5.5  | 13    | 7.5    |
| Mid        | 12.82              | 18.23            | 5.41 | 13    | 7.59   |
| High       | 12.82              | 18.54            | 5.72 | 13    | 7.28   |

Table 7. Peak to Average Ratio, Test Results, EVDO Radio, BC1

| OneX Radio |                    | BC1              |      |       |        |
|------------|--------------------|------------------|------|-------|--------|
| Channel    | Average Power(dBm) | Peak Power (dBm) | PAR  | Limit | Margin |
| Low        | 12.16              | 16.45            | 4.29 | 13    | 8.71   |
| Mid        | 11.75              | 15.88            | 4.13 | 13    | 8.87   |
| High       | 11.88              | 16.19            | 4.31 | 13    | 8.69   |

Table 8. Peak to Average Ratio, Test Results, OneX Radio, BC1



| Beacon Radio |                    | BCO (Part22)       |          |         |          |
|--------------|--------------------|--------------------|----------|---------|----------|
| Channel      | Average Power(dBm) | Antenna gain (dBi) | ERP (W)  | Limit W | Margin   |
| Low          | 4.95               | 0                  | 0.001905 | 500     | 499.9981 |
| Mid          | 5.68               | 0                  | 0.002254 | 500     | 499.9977 |
| High         | 5.38               | 0                  | 0.002104 | 500     | 499.9979 |

Table 9. ERP and EIRP, Test Results, Beacon Radio, BC0

| Beacon Radio |                    | BC1 (PART24) |          |       |          |
|--------------|--------------------|--------------|----------|-------|----------|
| Chanel       | Average Power(dBm) | Antenna gain | EIRP (W) | Limit | Margin   |
| Low          | 3.65               | 0            | 0.002317 | 1640  | 1639.998 |
| Mid          | 3.85               | 0            | 0.002427 | 1640  | 1639.998 |
| High         | 4.49               | 0            | 0.002812 | 1640  | 1639.997 |

Table 10. ERP and EIRP, Test Results, Beacon Radio, BC1

| EVDO Radio |                    | BC1 (PART24) |          |       |          |
|------------|--------------------|--------------|----------|-------|----------|
|            | Average Power(dBm) | Antenna gain | EIRP (W) | Limit | Margin   |
| Low        | 13.45              | 0            | 0.022131 | 1640  | 1639.978 |
| Mid        | 12.82              | 0            | 0.019143 | 1640  | 1639.981 |
| High       | 12.82              | 0            | 0.019143 | 1640  | 1639.981 |

Table 11. ERP and EIRP, Test Results, EVDO Radio, BC1

| OneX Radio |                    | BC1 (PART24) |          |       |          |
|------------|--------------------|--------------|----------|-------|----------|
|            | Average Power(dBm) | Antenna gain | EIRP (W) | Limit | Margin   |
| Low        | 12.16              | 0            | 0.016444 | 1640  | 1639.984 |
| Mid        | 11.75              | 0            | 0.014962 | 1640  | 1639.985 |
| High       | 11.88              | 0            | 0.015417 | 1640  | 1639.985 |

Table 12. ERP and EIRP, Test Results, OneX Radio, BC1



## Electromagnetic Compatibility Criteria for Intentional Radiators

### §2.1049 Frequency Stability 2.1049

**Test Requirement(s):** §2.1049 §24.238

**Test Procedures:** The EUT was placed inside a temperature chamber and Frequency measurements were made at the extremes of the specified temperature range and at intervals of than 10° centigrade through the range. The operating voltage is varied to +/- 15 % of the nominal voltage at normal temperature. The frequency deviations are then compared to frequency of normal operation and shall not exceed 1ppm.

**Test Results:** Equipment complies with this section.

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

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

| Beacon BC1   |             | 200                  |              |          |       |
|--------------|-------------|----------------------|--------------|----------|-------|
| Voltage (DC) | Temperature | Calculated Frequency | Δ Hz         | Δ ppm    | Limit |
| 120          | -30         | 1940.001867          | 1867         | 0.962371 | 1     |
| 120          | -20         | 1940                 | -0.5         | 0.000258 | 1     |
| 120          | -10         | 1940.00015           | 150          | 0.07732  | 1     |
| 120          | 0           | 1940                 | 0            | 0        | 1     |
| 120          | 10          | 1940                 | 0            | 0        | 1     |
| 120          | 20          | 1940                 | ----         |          | 1     |
| 120          | 30          | 1939.9985            | -1500        | 0.773196 | 1     |
| 120          | 40          | 1939.99855           | -1450        | 0.747423 | 1     |
| 120          | 50          | 1940.001805          | 1805         | 0.930412 | 1     |
| 102          | 20          | 1939.999215          | -785.0000002 | 0.404639 | 1     |
| 138          | 20          | 1940                 | 0            | 0        | 1     |

Table 13. Frequency Stability, Test Results, Beacon BC1

| EVDO BC1     |             | 700                  |         |          |       |
|--------------|-------------|----------------------|---------|----------|-------|
| Voltage (DC) | Temperature | Calculated Frequency | Δ Hz    | Δ ppm    | Limit |
| 120          | -30         | 1964.99825           | -1750   | 0.902062 | 1     |
| 120          | -20         | 1965.000256          | 255.5   | 0.131701 | 1     |
| 120          | -10         | 1964.999             | -1000   | 0.515464 | 1     |
| 120          | 0           | 1964.998575          | -1425   | 0.734536 | 1     |
| 120          | 10          | 1964.99825           | -1750   | 0.902062 | 1     |
| 120          | 20          | 1965                 | ----    |          | 1     |
| 120          | 30          | 1964.998355          | -1645   | 0.847938 | 1     |
| 120          | 40          | 1965.0019            | 1900    | 0.979381 | 1     |
| 120          | 50          | 1964.998288          | -1712.5 | 0.882732 | 1     |
| 102          | 20          | 1964.99875           | -1250   | 0.64433  | 1     |
| 138          | 20          | 1965                 | 0       | 0        | 1     |

Table 14. Frequency Stability, Test Results, EVDO BC1



| EVDO OneX    |             | 500                  |             |              |       |
|--------------|-------------|----------------------|-------------|--------------|-------|
| Voltage (DC) | Temperature | Calculated Frequency | $\Delta$ Hz | $\Delta$ ppm | Limit |
| 120          | -30         | 1955.001903          | 1902.775    | 0.980812     | 1     |
| 120          | -20         | 1955.001505          | 1504.525    | 0.775528     | 1     |
| 120          | -10         | 1955.001006          | 1006.03     | 0.518572     | 1     |
| 120          | 0           | 1955.001505          | 1504.525    | 0.775528     | 1     |
| 120          | 10          | 1954.9986            | -1400       | 0.721649     | 1     |
| 120          | 20          | 1955                 | ----        |              | 1     |
| 120          | 30          | 1955.00025           | 250         | 0.128866     | 1     |
| 120          | 40          | 1955.00006           | 60          | 0.030928     | 1     |
| 120          | 50          | 1955.001011          | 1010.65     | 0.520954     | 1     |
| 102          | 20          | 1955.0017            | 1700        | 0.876289     | 1     |
| 138          | 20          | 1955                 | 0           | 0            | 1     |

**Table 15. Frequency Stability, Test Results, EVDO OneX**



## 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 @ 869-894 MHz and 1930-1990 MHz; **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 |
| 1931            | 12.16           | 16.444         | 0               | 1                 | 0.00327                            | 1                           | 0.99673 | 20            | Pass   |
| 1931            | 14.35           | 27.227         | 0               | 1                 | 0.00542                            | 1                           | 0.99458 | 20            | Pass   |
| 1989            | 4.49            | 2.812          | 0               | 1                 | 0.00056                            | 1                           | 0.99944 | 20            | Pass   |
| 889.2           | 5.68            | 3.698          | 0               | 1                 | 0.00074                            | 1                           | 0.99926 | 20            | Pass   |

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



## IV. Test Equipment



## 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.



CommScope  
Small Cell/ Model S1000C

Electromagnetic Compatibility  
End of Report  
CFR Title 47 Part 22 Subpart H & Part 24 Subpart E

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# End of Report