



EM7355/EM7655 Modem

Test Report

FOR

CDMA and EVDO

Rev. 2.1

FCC and IC Certifications

IC: 2417C-EM7355
FCC ID: N7NEM7355

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1 Introduction and Purpose

This document provides test data for the EM7355 modem output power intended for FCC and Industry Canada certifications.

1.1 Revision history

| Rev | Date | Author | Summary of changes | ECO # |
|-----|---------------|--------------|---|-------|
| 1.0 | Aug.15, 2012 | Markus Myers | First Release | |
| 2.0 | Feb. 05, 2013 | Markus Myers | Updated channel frequency information, BC10 power and BC10 band edge plots. | |
| 2.1 | Feb 8, 2013 | Markus Myers | Updated limit lines on emission plots | |

2 Test Summary

| FCC Rule | IC Standards | DESCRIPTION OF TEST | RESULT | PAGE |
|-----------------------------------|------------------------------|--|----------|------|
| 2.1046 | RSS-132, 4.4 RSS-133, 6.4 | RF Power Output | Complies | 5 |
| 2.202, 22.917, 24.238, 90.691 | RSS-Gen, 4.6 | Occupied Bandwidth | Complies | 16 |
| 2.1051, 22.917, 24.238, 90.210 | RSS-132, 4.5 RSS-133, 6.5 | Out of Band Emissions at Antenna Terminals | Complies | 45 |
| 2.1051, 22.917, 24.238, 90.691 | RSS-Gen, 4.6 | Block Edge Compliance | Complies | 106 |
| 2.1055, 22.355, 24.235, 90.213 | RSS-132, 4.3 RSS-133, 6.3 | Frequency Stability versus Temperature | Complies | 122 |
| 2.1055, 22.355, 24.235, 90.213 | RSS-132, 4.3 RSS-133, 6.3 | Frequency Stability versus Voltage | Complies | 124 |
| 24.232 | | Peak to Average Ratio | Complies | 126 |

3 Description of Equipment under Test

The EM7355/EM7655 modem, referred to as “EUT” hereafter, is a multi-band wireless modem operating on the GSM/GPRS/EDGE/UMTS/LTE/CDMA networks. The table below shows the supported North American bands for the device.

| Technology | Band | UL Freq. (MHz) | DL Freq. (MHz) | Max Power |
|------------|------|----------------|----------------|-------------------|
| LTE | B2 | 1850 – 1910 | 1930 – 1990 | 23 dBm (+/- 1 dB) |
| | B4 | 1710 – 1755 | 2110 – 2155 | 23 dBm (+/- 1 dB) |
| | B5 | 824 – 849 | 869 – 894 | 23 dBm (+/- 1 dB) |
| | B13 | 777 – 787 | 746 – 756 | 23 dBm (+/- 1 dB) |
| | B17 | 704 – 716 | 734 – 746 | 23 dBm (+/- 1 dB) |

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| | | | | |
|---------------------------------|-------|---------------|-------------|-------------------|
| | B25 | 1850 – 1915 | 1930 – 1995 | 23 dBm (+/- 1 dB) |
| WCDMA / HSDPA/ HSUPA / HSPA+ | B2 | 1850 – 1910 | 1930 – 1990 | 23 dBm (+/- 1 dB) |
| | B4 | 1710 – 1755 | 2110 – 2155 | 23 dBm (+/- 1 dB) |
| | B5 | 824 – 849 | 869 – 894 | 23 dBm (+/- 1 dB) |
| | BC0 | 824 – 849 | 869 – 894 | 24 dBm (+/- 1 dB) |
| CDMA / EVDO | BC1 | 1850 – 1910 | 1930 – 1990 | 24 dBm (+/- 1 dB) |
| | BC10* | 817.0 – 824.0 | 862.0 – 869 | 24 dBm (+/- 1 dB) |
| | G850 | 824 – 849 | 869 – 894 | 32.5 dBm (+/-1dB) |
| GSM | G1900 | 1850 – 1910 | 1930 – 1990 | 29.5 dBm (+/-1dB) |
| | G850 | 824 – 849 | 869 – 894 | 27 dBm (+/-1dB) |
| EDGE | G1900 | 1850 – 1910 | 1930 – 1990 | 26 dBm (+/-1dB) |

* Only BC10 subclass 2 and 3 frequencies are supported by hardware and firmware.

3.1 BC10 Frequency Support

The device supports BC10 subclass 2 and 3 frequencies only as defined in 3GPP2 C.S0057-D.

3GPP2 C.S0057-D v1.0

Table 4.1.11-1. Band Class 10 Block Frequency Correspondence

| System Designator | Band Subclass | Transmit Frequency Band (MHz) | |
|-------------------|---------------|-------------------------------|-----------------|
| | | Access Terminal | Access Network |
| A | 0 | 806.000–811.000 | 851.000–856.000 |
| B | 1 | 811.000–816.000 | 856.000–861.000 |
| C | 2 | 816.000–821.000 | 861.000–866.000 |
| D | 3 | 821.000–824.000 | 866.000–869.000 |
| E | 4 | 896.000–901.000 | 935.000–940.000 |

The Sprint Requirements (Sprint Customer Equipment Band Class 10 Requirements V1.3.0) limit the useable channels from 457 – 670 (817.90 MHz – 823.1 MHz inclusive).

3.2 Differences between EM7355 and EM7655

The EM7355 and EM7655 differ only in pcb length and host interface connector. Both products utilize the same pcb RF layout, components and firmware. Please refer to document “7x55 Comparison.pdf”.

4 Compliance Test Equipment List

| EQUIPMENT | MANUFACTURER | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|-----------|--------------|-----------|------------|---------------|
|-----------|--------------|-----------|------------|---------------|

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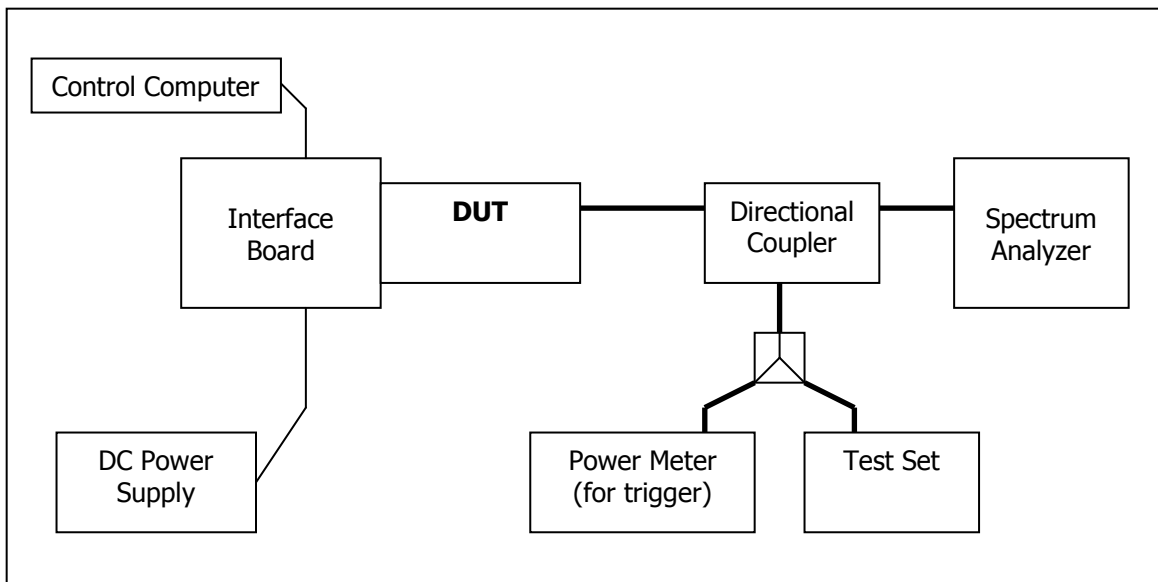
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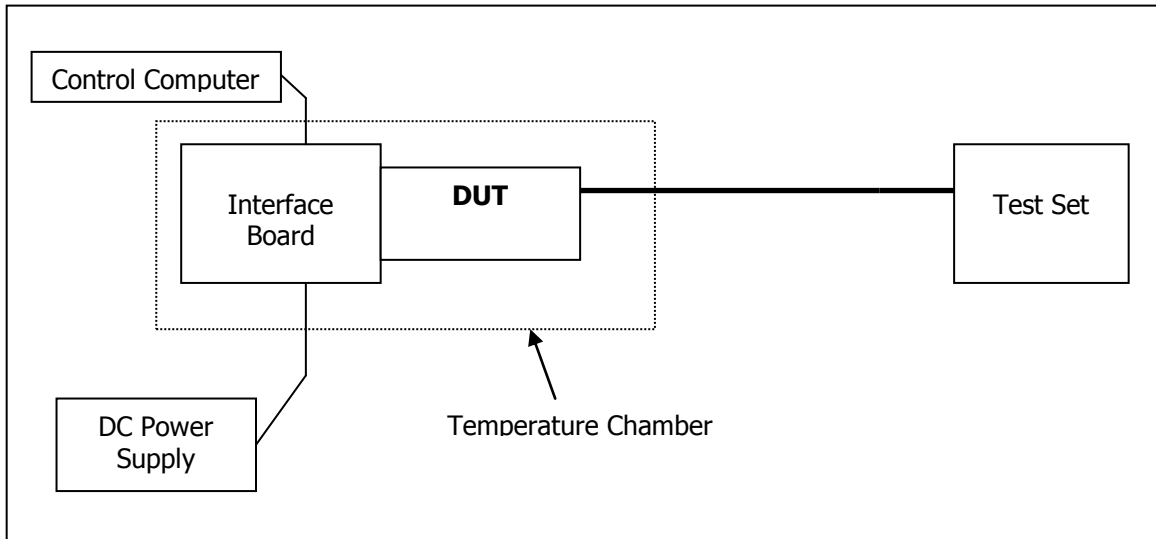
| | | | | |
|---------------------|-----------------|------------|--------|------------------|
| Control Computer | TC | Generic PC | 100488 | N/A |
| Wireless Test Set | Rohde & Schwarz | CMU200 | 110521 | October 27, 2013 |
| Wireless Test Set | Rohde & Schwarz | CMW500 | 101060 | June 6, 2014 |
| Spectrum Analyzer | Rohde & Schwarz | FSP | 100060 | October 27, 2013 |
| DC Power Supply | HP | 6632A | 3530A | N/A |
| Interface Board | Shop built | ATEMux | N/A | N/A |
| Directional Coupler | Pasternack | PE2209-10 | N/A | N/A |

5 Test Setup Block Diagrams

5.1 Test Setup 1



5.2 Test Setup 2



6 RF Power Output

FCC 2.1046

6.1 Test Procedure

The transmitter output was connected to a Rohde & Schwarz CMW500 Test Set and configured to operate at maximum power in a call. The power was measured using the CDMA Tx measurement of the CMW500. Refer to Test Setup 1.

6.1.1 CDMA/EVDO Max Power setup

For CDMA Loopback Call per 3GPP2 CS00114.4.5 Maximum Output Power

- Configure Fundamental Channel Test Mode 1 with 9600 bps data rate.
- Set the Service option to SO2, the radio configuration to RC1, set forward channel power to -85 dBm and connect call.
- Set the reverse power control bits to "All up" and measure the power at the EM7355 module antenna connector.
- Repeat above process for SO9 and SO55 service options and RC1 and RC3 radio configuration.

For EVDO Loopback Call per 3GPP2 CS0033 4.3.4 Maximum Output Power

- For Subtype 0 or 1 Physical Layer, configure the Test Application RTAP (R0) so that the Reverse Data Channel rate corresponds to 153.6 kbps.
- Set Ior to -85 dBm/1.23 MHz and connect call.
- Set the reverse power control bits to "All up" and measure the power at the EM7355 module antenna connector.

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- Repeat above process for Test Application RETAP (RA) service option.

6.1.2 Test Results CDMA/EVDO Output Power

| Band | Channel | Frequency (MHz) | CDMA | | | | | | 1x EvDO | |
|-------|---------|--------------------|-------|-------|-------|-------|-------|-------|---------|--------|
| | | | SO2 | | SO9 | | SO55 | | Rel. 0 | Rel. A |
| | | | RC1 | RC3 | RC1 | RC3 | RC1 | RC3 | RTAP | RETAP |
| BC0 | 1013 | 824.7 | 24.31 | 24.27 | 24.29 | 24.31 | 24.12 | 24.37 | 24.07 | 24.16 |
| | 384 | 836.52 | 24.21 | 24.24 | 24.21 | 24.23 | 24.1 | 24.25 | 24.12 | 24.15 |
| | 777 | 848.31 | 23.95 | 24.02 | 24.08 | 24.04 | 23.94 | 24.03 | 24.06 | 24.06 |
| BC1 | 25 | 1851.25 | 24.23 | 24.28 | 24.36 | 24.34 | 24.31 | 24.35 | 24.28 | 24.13 |
| | 600 | 1880 | 24.32 | 24.29 | 24.36 | 24.36 | 24.34 | 24.31 | 24.26 | 24.17 |
| | 1175 | 1908.75 | 24.29 | 24.33 | 24.31 | 24.33 | 24.29 | 24.3 | 24.13 | 24.12 |
| BC10* | 476 | 817.9 | 24.21 | 24.07 | 24.16 | 24.11 | 24.05 | 24.05 | 24.07 | 24.06 |
| | 560 | 820 | 23.95 | 24.0 | 24.0 | 23.98 | 23.94 | 23.97 | 23.99 | 23.97 |
| | 684 | 823.1 | 23.9 | 24.02 | 23.92 | 24.0 | 23.99 | 24.02 | 24.03 | 23.99 |

*Note: Only BC10 Sub-Band 2 and 3 are supported by hardware and firmware

7 Occupied Bandwidth

FCC 2.1049

7.1 Test Procedure

The transmitter output was connected to a spectrum analyzer through a calibrated coaxial cable and a directional coupler. The occupied bandwidth (defined as the 99% Power Bandwidth) was measured with the spectrum analyzer at low, middle, and high frequencies in each band. The -26dB bandwidth was also measured and recorded. Refer to Test Setup 1.

7.2 Test Results

The measurements were performed with the

7.2.1 CDMA Summary Results

| Band | Channel | Frequency | Configuration | 99% OBW (MHz) | -26 dB OBW (MHz) | Plot No. | |
|------|---------|-----------|---------------|------------------|------------------------|----------|---------|
| BC0 | 384 | 836.52 | SO2 | RC1 | 1.284 | 1.437 | 7.2.2.1 |
| | | | | RC3 | 1.274 | 1.437 | 7.2.2.2 |
| | | | 1x EvDo | Rel. A | 1.289 | 1.442 | 7.2.3.1 |
| BC1 | 600 | 1880 | SO2 | RC1 | 1.274 | 1.446 | 7.2.2.3 |
| | | | | RC3 | 1.279 | 1.437 | 7.2.2.4 |
| | | | 1x EvDo | Rel. A | 1.279 | 1.437 | 7.2.3.2 |

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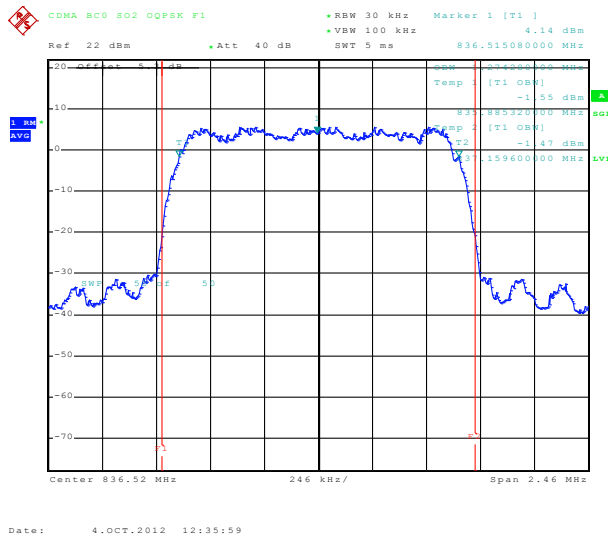
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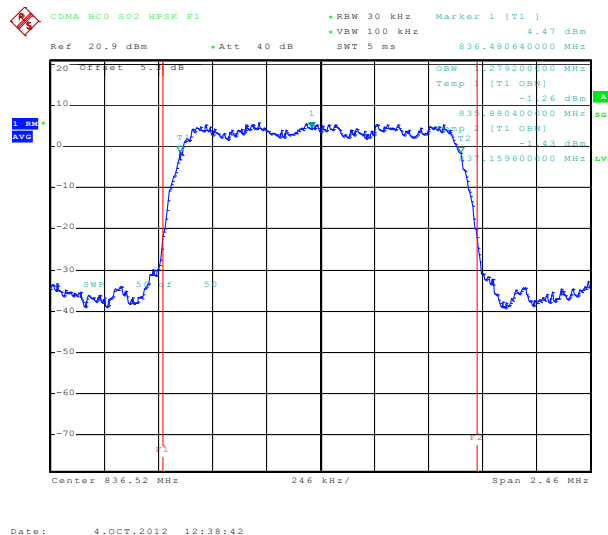
| | | | | | | | |
|-------|-----|-------|---------|--------|-------|-------|---------|
| BC10* | 560 | 820.0 | SO2 | RC1 | 1.274 | 1.437 | 7.2.2.5 |
| | | | | RC3 | 1.279 | 1.442 | 7.2.2.6 |
| | | | 1x EvDo | Rel. A | 1.274 | 1.456 | 7.2.3.3 |

7.2.2 CDMA Test Plots

7.2.2.1 CDMA Occupied Bandwidth, SO2, RC1, BC0 Mid channel, 836.52 MHz, 99% BW



7.2.2.2 CDMA Occupied Bandwidth, SO2, RC3, BC0 Mid channel, 836.52 MHz, 99% BW

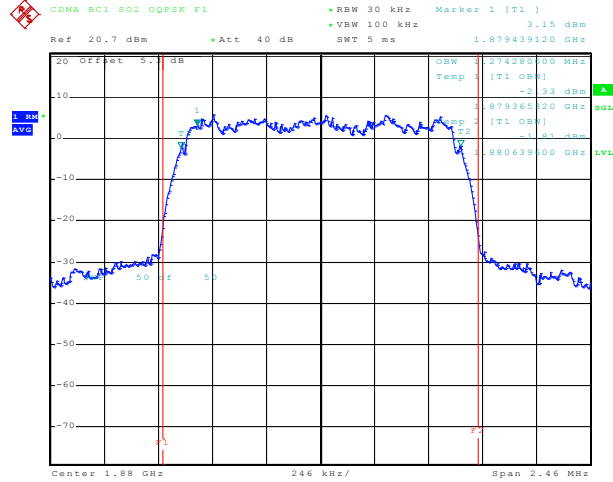


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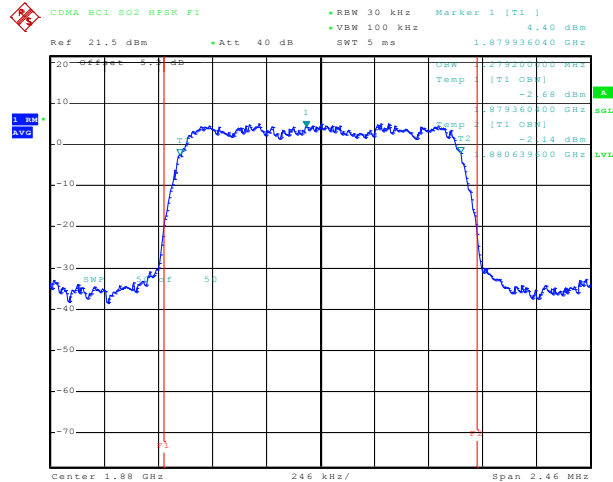
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7.2.2.3 CDMA Occupied Bandwidth, SO2, RC1, BC1 Mid channel, 1880.0 MHz, 99% BW



Date: 4.OCT.2012 13:58:32

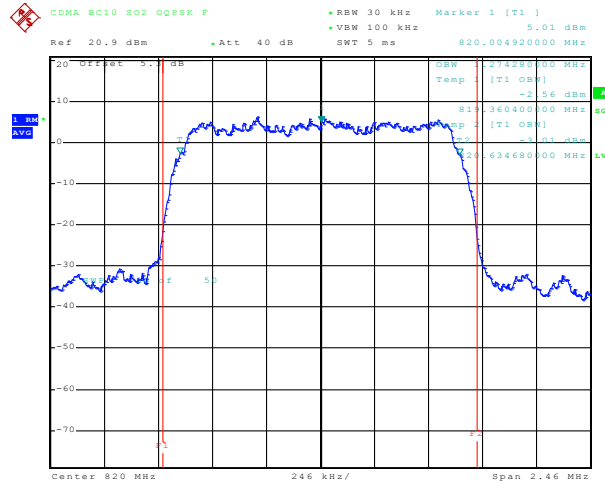
7.2.2.4 CDMA Occupied Bandwidth, SO2, RC3, BC1 Mid channel, 1880.0 MHz, 99% BW



Date: 4.OCT.2012 14:01:14

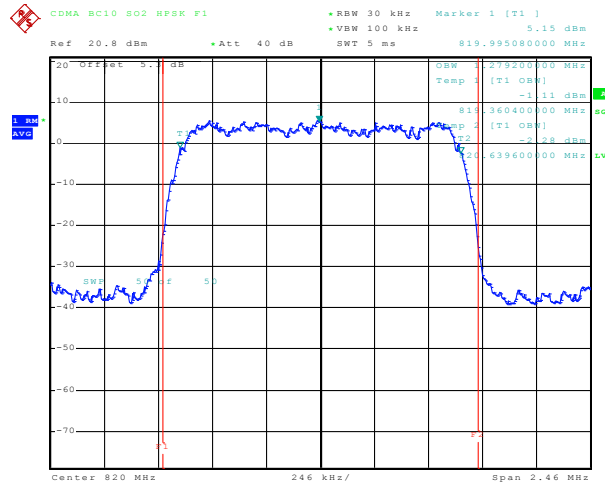
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7.2.2.5 CDMA Occupied Bandwidth, SO2, RC1, BC10 Mid channel, 820.0 MHz, 99% BW



Date: 4.OCT.2012 11:22:58

7.2.2.6 CDMA Occupied Bandwidth, SO2, RC3, BC10 Mid channel, 820.0 MHz, 99% BW



Date: 4.OCT.2012 11:25:46

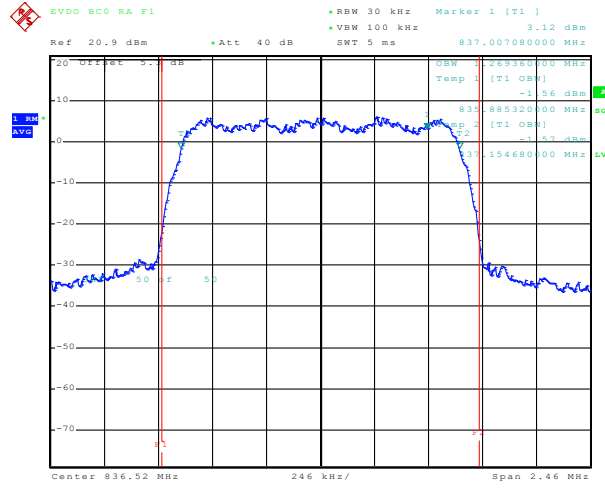
7.2.3 1x EvDO Test Plots

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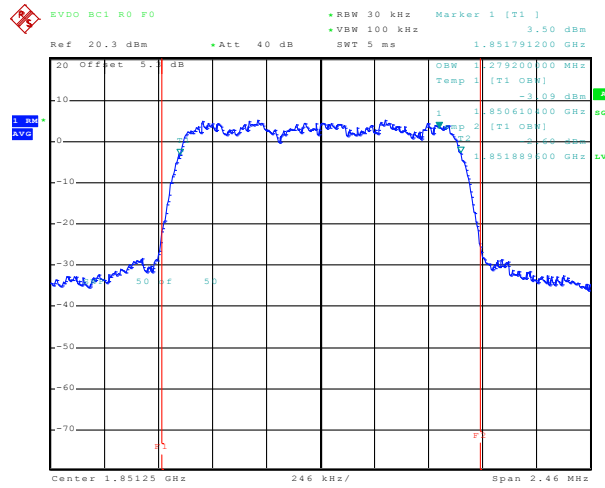
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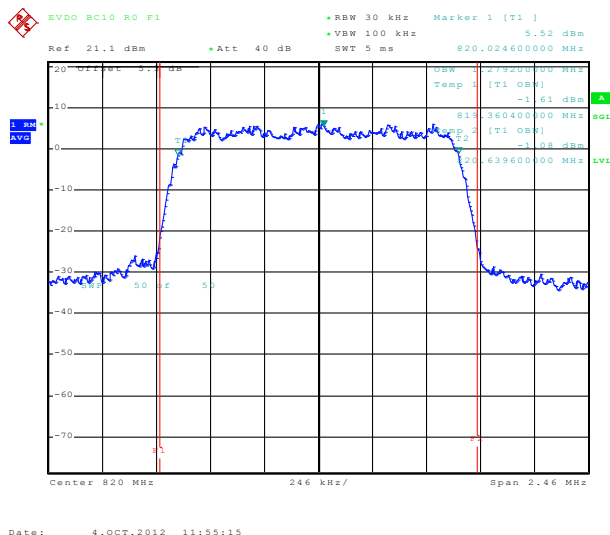
7.2.3.1 1x EvDO Occupied Bandwidth, Rel. A, BC0 Mid channel, 836.52 MHz, 99% BW



7.2.3.2 1x EvDO Occupied Bandwidth, Rel. A, BC1 Mid channel, 1880.0 MHz, 99% BW



7.2.3.3 1x EvDO Occupied Bandwidth, Rel. A, BC10 Mid channel, 820.0 MHz, 99% BW



8 Out of Band Emissions at Antenna Terminals

FCC 2.1051, 22.917, 24.238, 90.691(a)

Out of Band Emissions:

The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency outside the frequency band by at least (43 + 10 log P) dB. The out of band emission limit translates to a worst case absolute limit of -13dBm in this case.

8.1 Test Procedure

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band emissions, if any, up to 10th harmonic. The EUT was scanned for spurious emissions from 1MHz to 20GHz with sufficient bandwidth and video resolution. Data plots are included. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were captured. Refer to Test Setup 2.

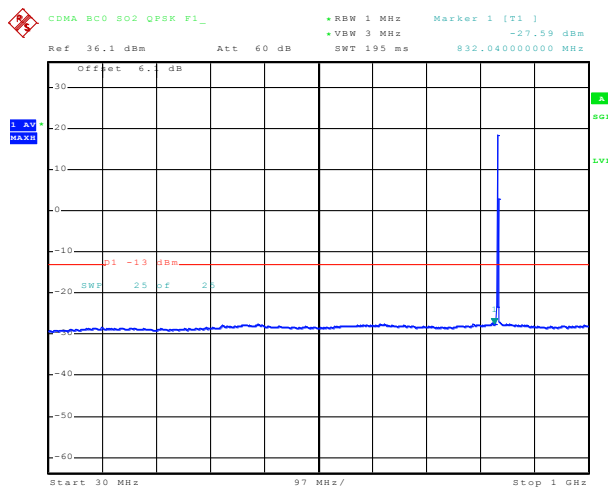
8.2 Test Results

| Band | Channel | Frequency | Configuration | Plot No. | Status |
|------|---------|-----------|---------------|-------------------|--------|
| BC0 | 384 | 836.52 | SO2 | 8.2.1.1, 8.2.1.2 | PASS |
| | | | 1x EvDo | 8.2.2.1, 8.2.2.2 | PASS |
| BC1 | 600 | 1880 | SO2 | 8.2.1.3 – 8.2.1.5 | PASS |
| | | | 1x EvDo | 8.2.2.3 – 8.2.2.5 | PASS |
| BC10 | 560 | 820 | SO2 | 8.2.1.6, 8.2.1.7 | PASS |
| | | | 1x EvDo | 8.2.2.6, 8.2.2.7 | PASS |

The plots below show that the conducted emission limits requirements are met.

8.2.1 CDMA Test Plots

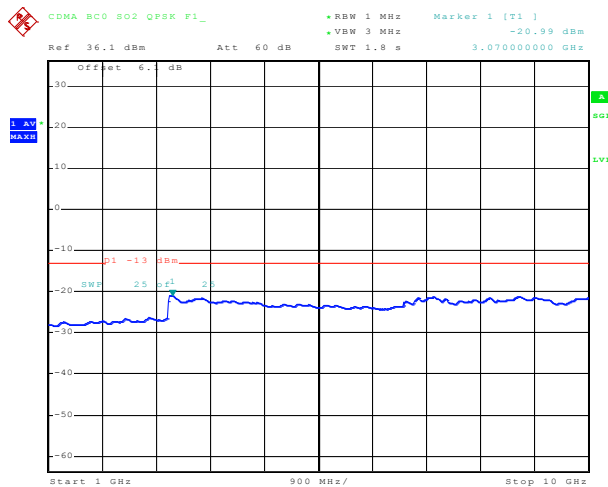
8.2.1.1 Out of Band Emissions at Antenna Terminals CDMA BC0, Mid channel, 836.52 MHz, 2 Hz to 1 GHz



Date: 4.OCT.2012 12:07:30

Note: The strong emission shown in each case is the carrier signal.

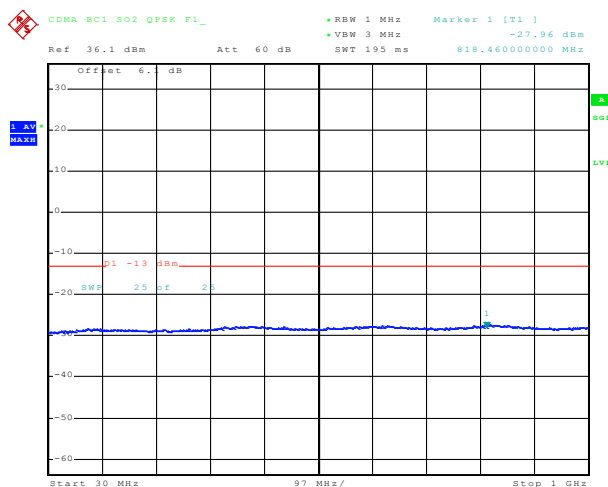
8.2.1.2 Out of Band Emissions at Antenna Terminals CDMA BC0, Mid channel, 836.52 MHz, 1 GHz to 10 GHz



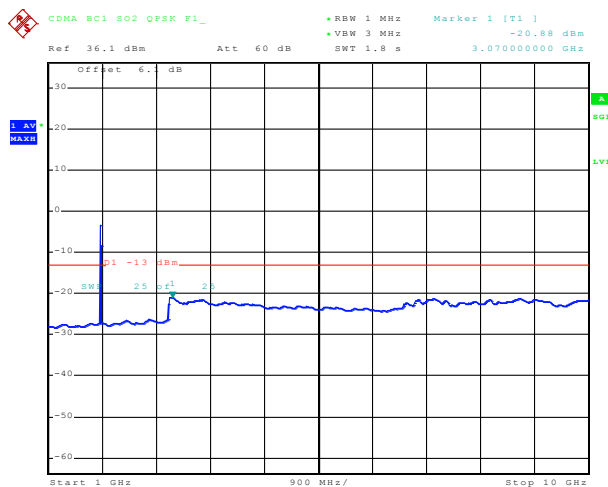
Date: 4.OCT.2012 12:08:41

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8.2.1.3 Out of Band Emissions at Antenna Terminals CDMA BC1, Mid channel, 1880.0 MHz, 2 Hz to 1 GHz



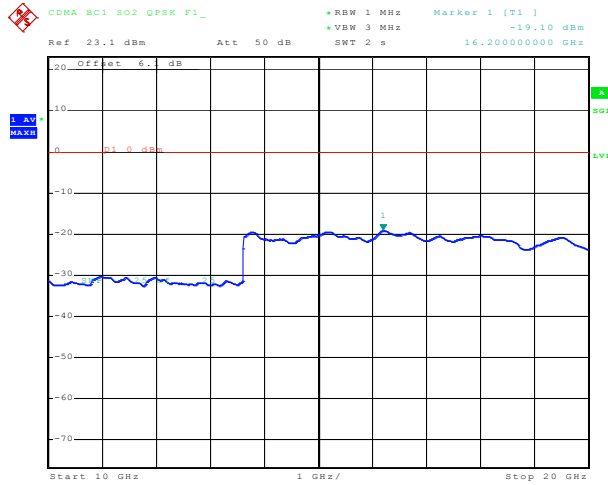
8.2.1.4 Out of Band Emissions at Antenna Terminals CDMA BC1, Mid channel, 1880.0 MHz, 1 GHz to 10 GHz



Note: The strong emission shown in each case is the carrier signal.

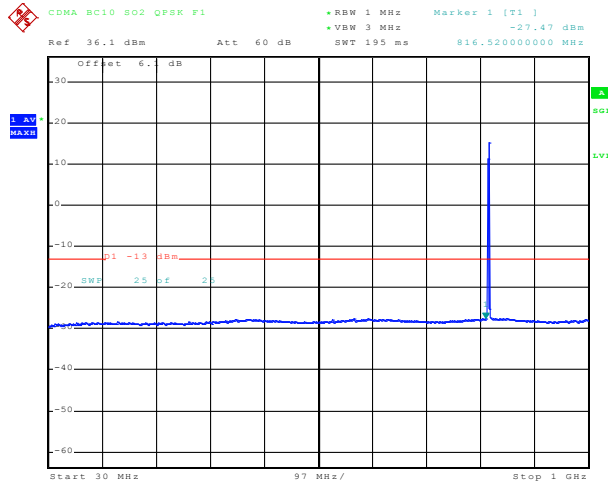
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8.2.1.5 Out of Band Emissions at Antenna Terminals CDMA BC1, Mid channel, 1880.0 MHz, 10 GHz to 20 GHz



Date: 4.OCT.2012 13:23:36

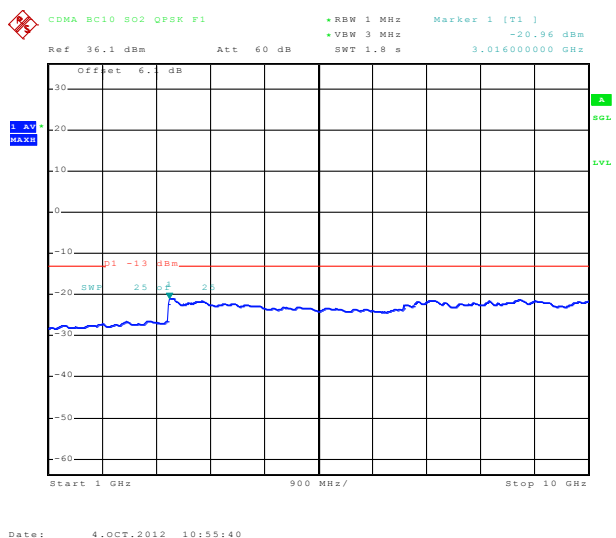
8.2.1.6 Out of Band Emissions at Antenna Terminals CDMA BC10, Mid channel, 820.0 MHz, 2 Hz to 1 GHz



Date: 4.OCT.2012 10:54:28

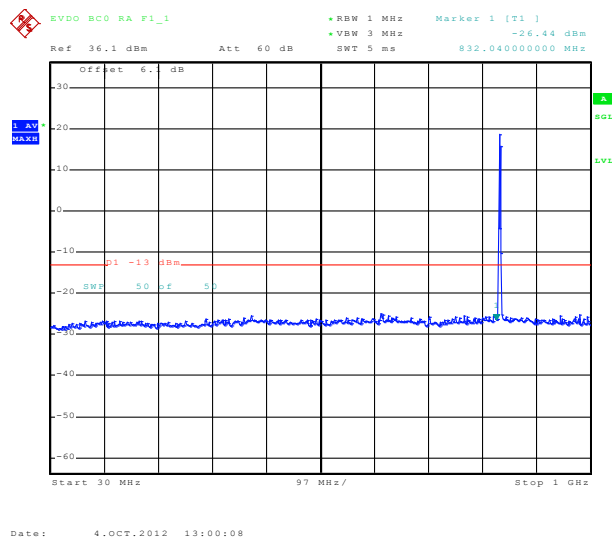
Note: The strong emission shown in each case is the carrier signal.

8.2.1.7 *Out of Band Emissions at Antenna Terminals CDMA BC10, Mid channel, 820.0 MHz, 1 GHz to 10 GHz*



8.2.2 EVDO Rel. A Test Plots

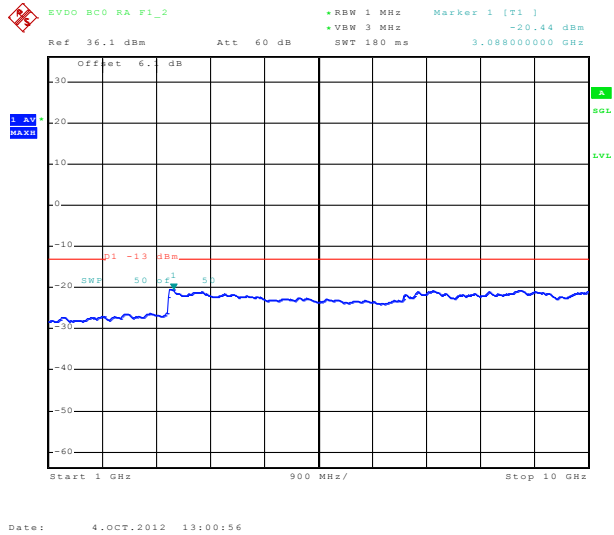
8.2.2.1 *Out of Band Emissions at Antenna Terminals 1x EvDO BC0, Mid channel, 836.52 MHz, 2 Hz to 1 GHz*



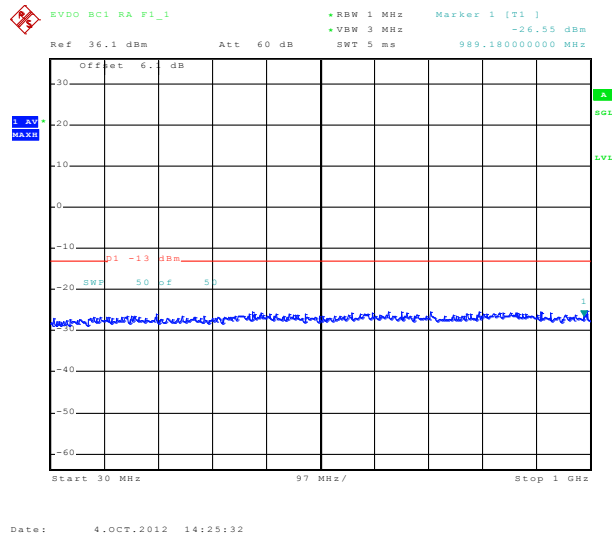
Note: The strong emission shown in each case is the carrier signal.

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8.2.2.2 Out of Band Emissions at Antenna Terminals 1x EvDO BC0, Mid channel, 836.52 MHz, 1 GHz to 10 GHz

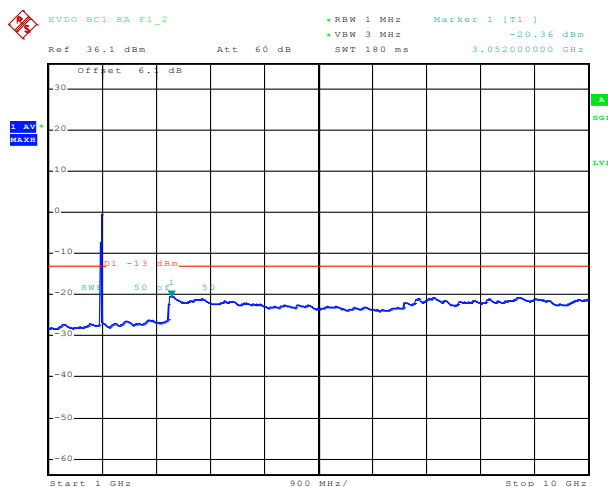


8.2.2.3 Out of Band Emissions at Antenna Terminals 1x EvDO BC1, Mid channel, 1880.0 MHz, 2 Hz to 1 GHz



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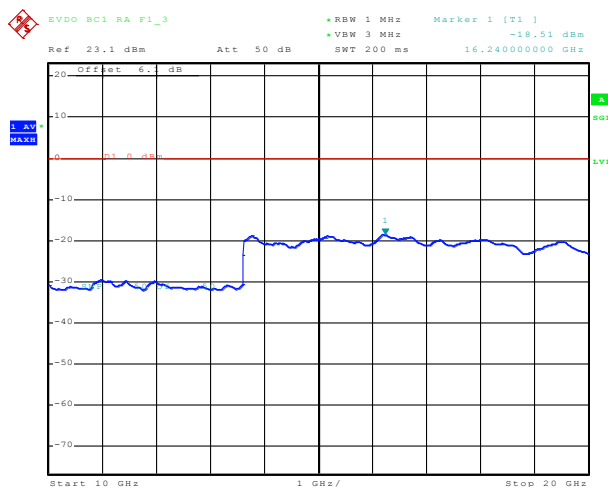
8.2.2.4 Out of Band Emissions at Antenna Terminals 1x EvDO BC1, Mid channel, 1880.0 MHz, 1 GHz to 10 GHz



Date: 4.OCT.2012 14:26:20

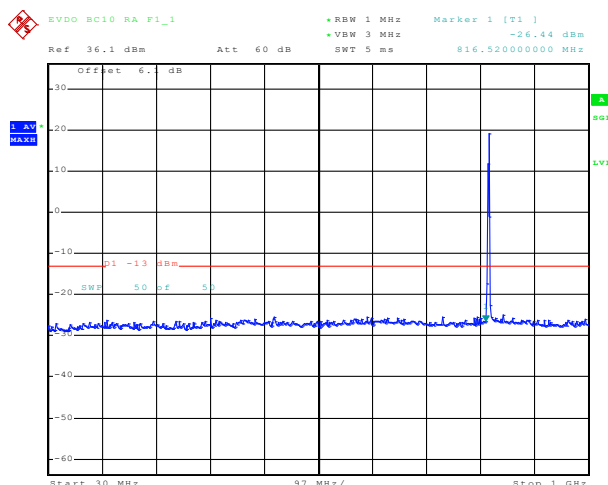
Note: The strong emission shown in each case is the carrier signal.

8.2.2.5 Out of Band Emissions at Antenna Terminals 1x EvDO BC1, Mid channel, 1880.0 MHz, 10 GHz to 20 GHz



Date: 4.OCT.2012 14:26:55

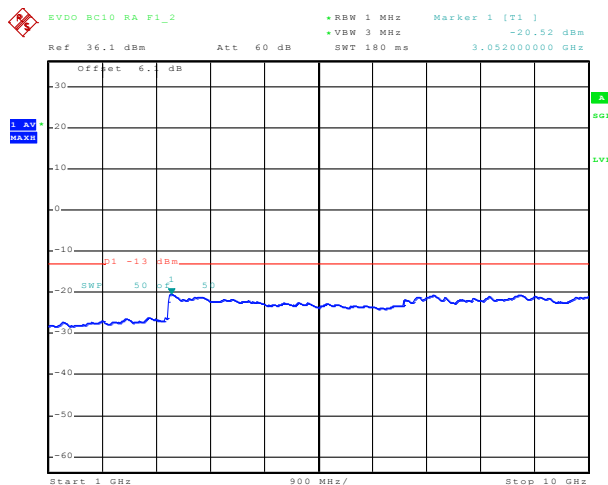
8.2.2.6 *Out of Band Emissions at Antenna Terminals 1x EvDO BC10, Mid channel, 820.0 MHz, 2 Hz to 1 GHz*



Date: 4.OCT.2012 11:47:28

Note: The strong emission shown in each case is the carrier signal.

8.2.2.7 *Out of Band Emissions at Antenna Terminals 1x EvDO BC10, Mid channel, 820.0 MHz, 1 GHz to 10 GHz*



Date: 4.OCT.2012 11:48:16

9 Block Edge Compliance

FCC Part 2.1051, 22.917, 24.238, 90.691(a)

9.1 Test Procedure

The transmitter output was connected to a Rohde & Schwarz CMU200 Test Set (or CMW500 for LTE), through a coaxial RF cable and a directional coupler, and configured to operate at maximum power. The block edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer. Refer to Test Setup 1.

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The resolution bandwidth was set to at least 1% of the emission bandwidth (where applicable). The power was scaled accordingly:

$$\text{Power offset} = 10 \cdot \log(\text{FCC_RBW} / \text{Measurement_RBW})$$

9.2 Test Results

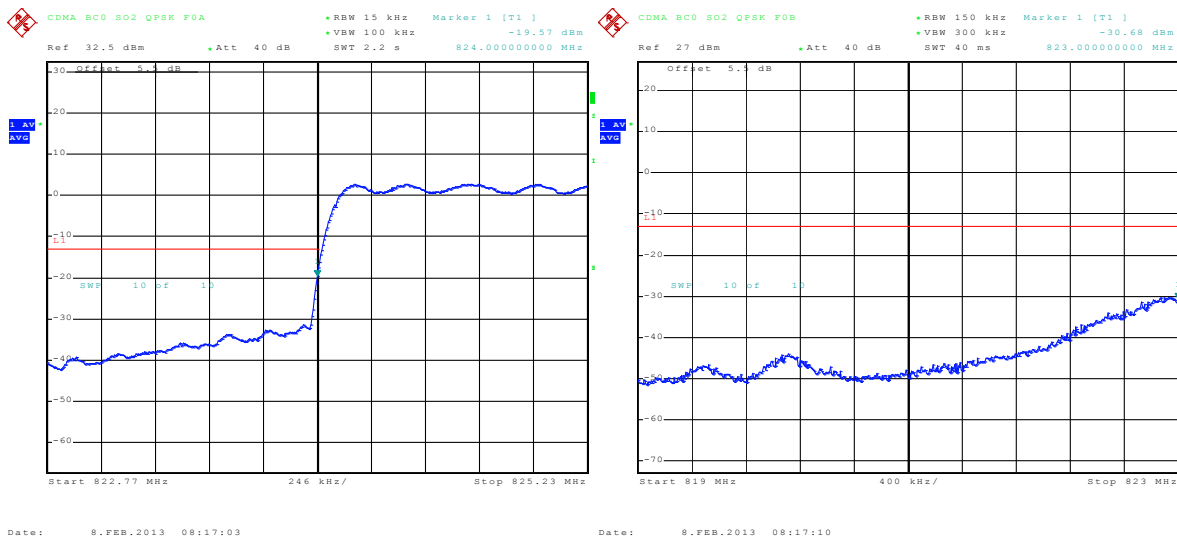
| Block Test | Band | Frequency Boundaries (MHz) | Channels Tested | Channel Frequency (MHz) | Configuration | Corresponding Plots | Result |
|------------|-------|------------------------------|-----------------|-------------------------|---------------|---------------------|----------|
| CDMA | BC0 | Below 824 MHz, above 849 MHz | 128, 251 | 824.7, 848.31 | RC1 (OQPSK) | 9.2.1.1, 9.2.1.2 | Complies |
| | | | | | RC3 (HPSK) | 9.2.1.3, 9.2.1.4 | |
| | BC1 | Below 1850MHz, above 1910MHz | 512, 810 | 1851.25, 1908.75 | RC1 (OQPSK) | 9.2.1.5, 9.2.1.6 | Complies |
| | | | | | RC3 (HPSK) | 9.2.1.7, 9.2.1.8 | |
| | BC10* | Below 817MHz, above 824MHz | 457, 684 | 817.90, 823.10 | RC1 (OQPSK) | 9.2.1.9, 9.2.1.10 | Complies |
| | | | | | RC3 (HPSK) | 9.2.1.11, 9.2.1.12 | |
| 1x EvDO | BC0 | Below 824 MHz, above 849 MHz | 128, 251 | 824.7, 848.31 | Rel. A | 9.2.2.1, 9.2.2.2 | Complies |
| | BC1 | Below 1850MHz, above 1910MHz | 512, 810 | 1851.25, 1908.75 | Rel. A | 9.2.2.3, 9.2.2.4 | Complies |
| | BC10* | Below 817MHz, above 824MHz | 457, 684 | 817.90, 823.10 | Rel. A | 9.2.2.5, 9.2.2.6 | Complies |

*Note: Only BC10 Sub-Band 2 and 3 are supported by hardware and firmware

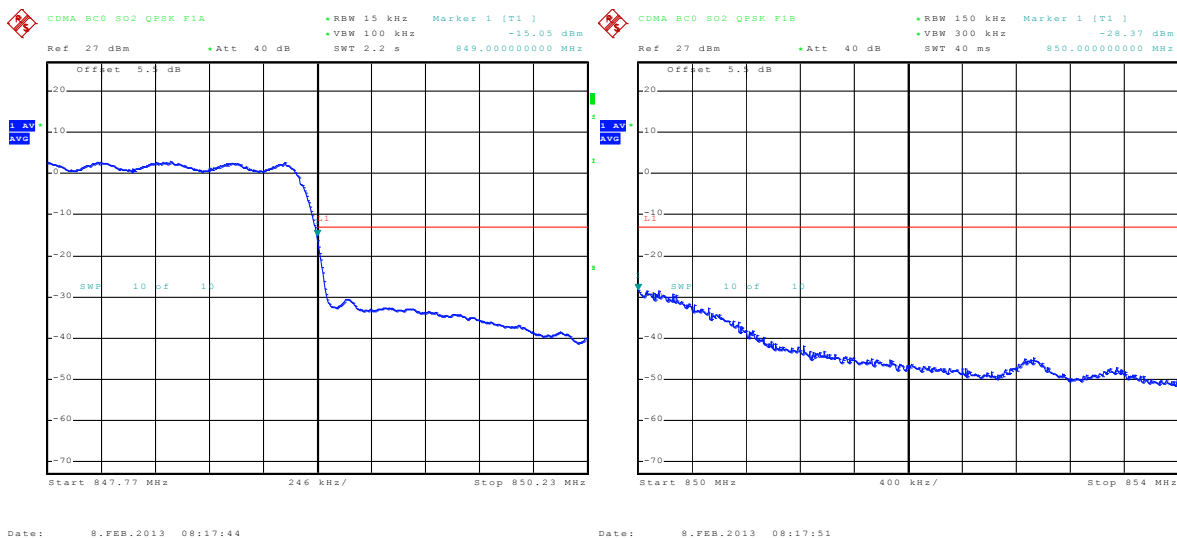
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9.2.1 CDMA Test Plots

9.2.1.1 CDMA BC0, RC1, low channel, below 824 MHz

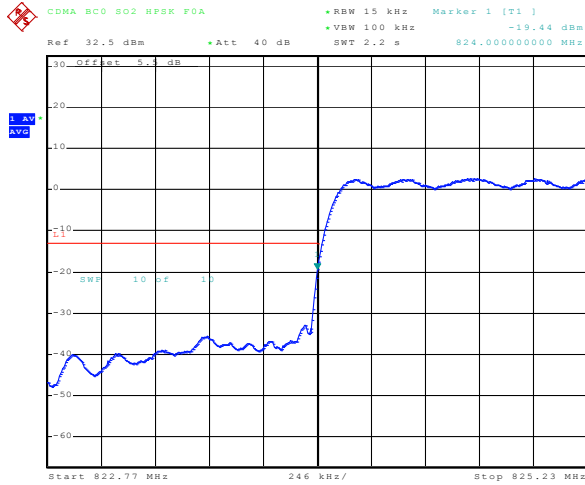


9.2.1.2 CDMA BC0, RC1, high channel, above 849 MHz

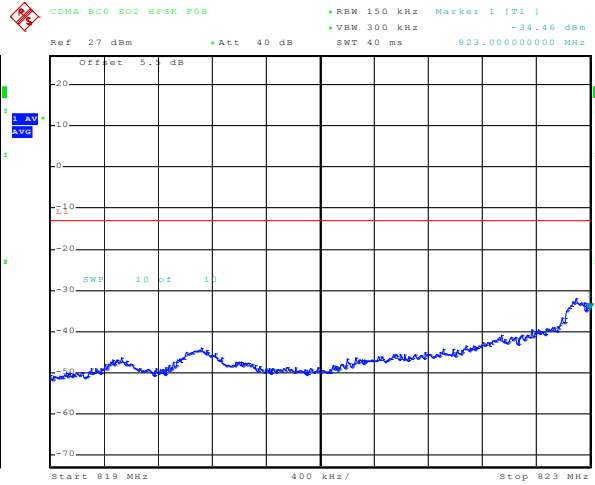


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9.2.1.3 CDMA BC0, RC3, low channel, below 824 MHz

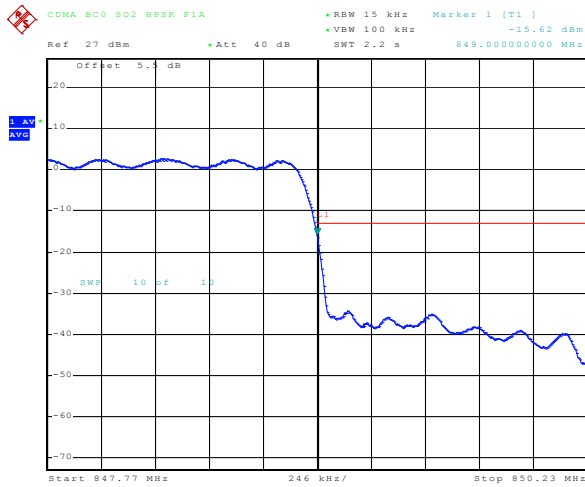


Date: 7.FEB.2013 18:28:31

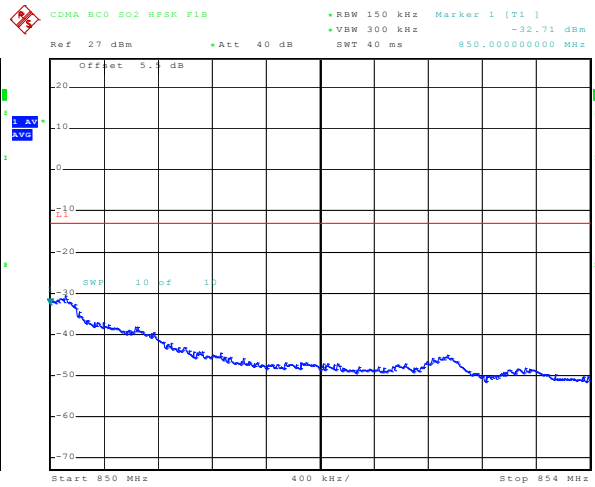


Date: 7.FEB.2013 18:28:38

9.2.1.4 CDMA BC0, RC3, high channel, above 849 MHz

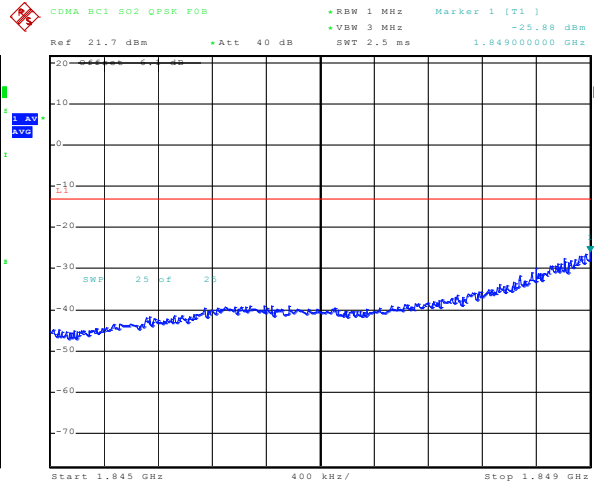
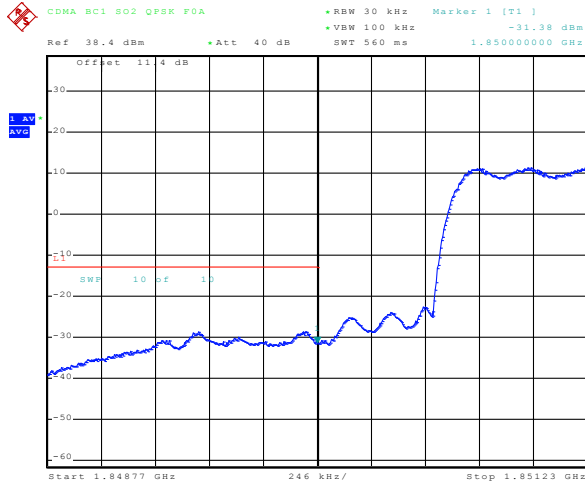


Date: 7.FEB.2013 18:29:12

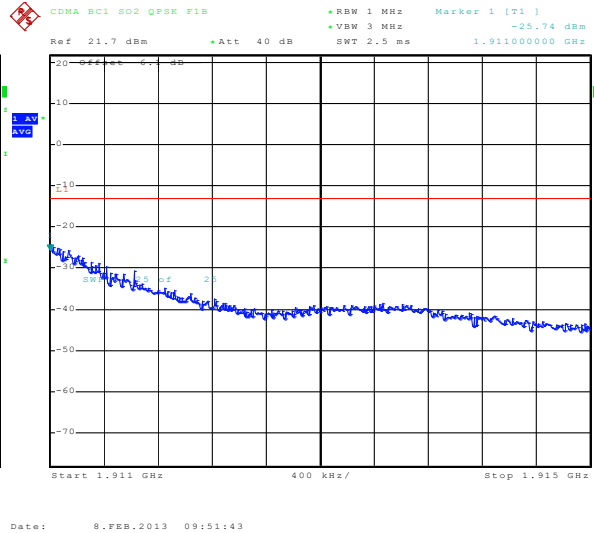
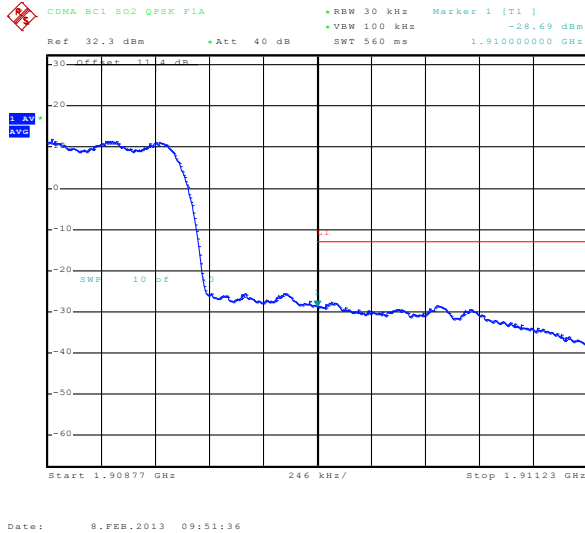


Date: 7.FEB.2013 18:29:19

9.2.1.5 CDMA BC1, RC1, low channel, below 1850 MHz

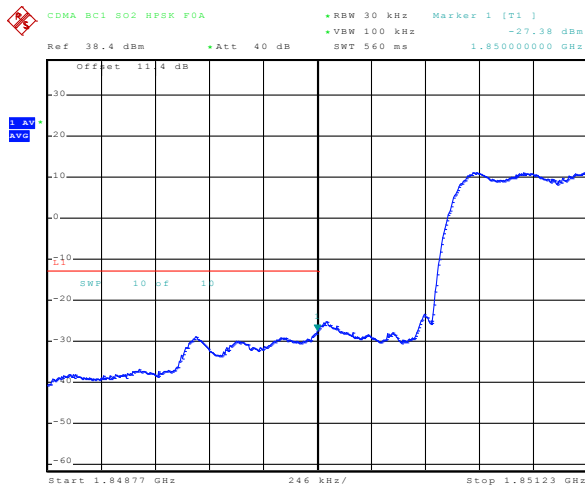


9.2.1.6 CDMA BC1, RC1, high channel, above 1910 MHz

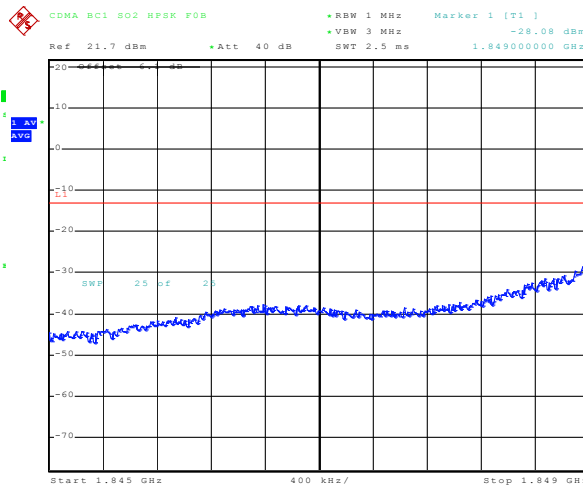


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9.2.1.7 CDMA BC1,RC3, low channel, below 1850 MHz

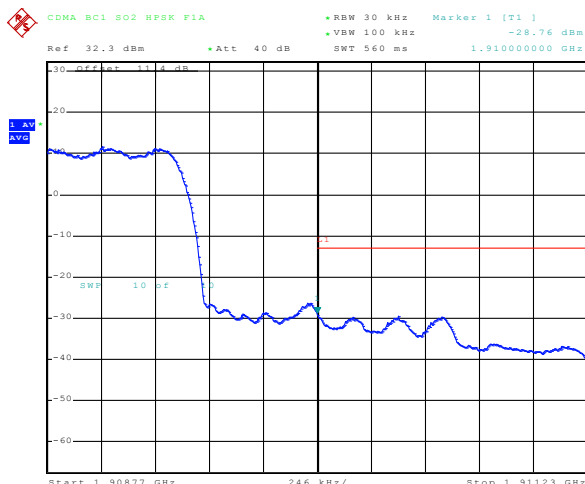


Date: 8.FEB.2013 09:53:14

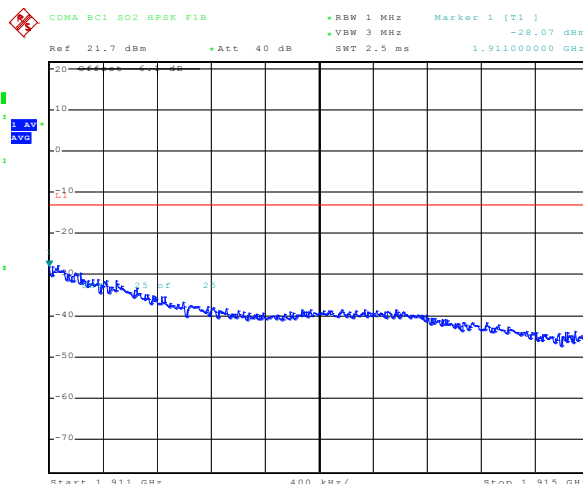


Date: 8.FEB.2013 09:53:22

9.2.1.8 CDMA BC1, RC3, high channel, above 1910 MHz



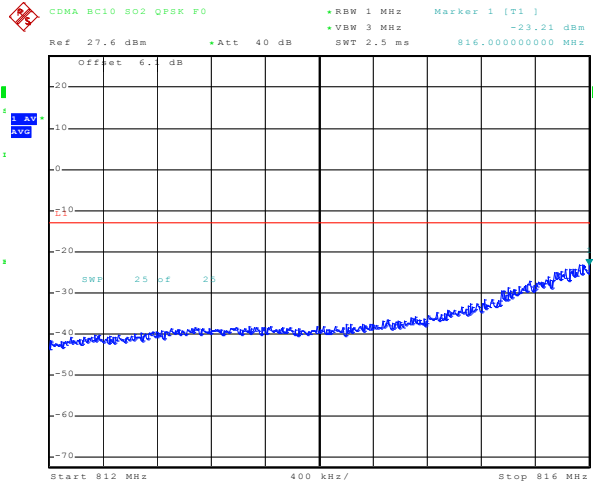
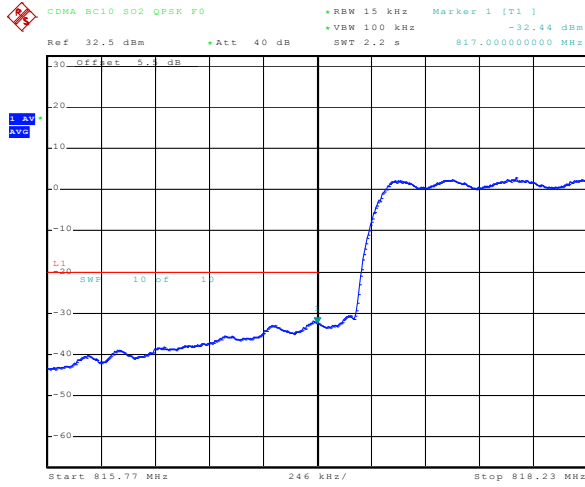
Date: 8.FEB.2013 09:53:39



Date: 8.FEB.2013 09:53:46

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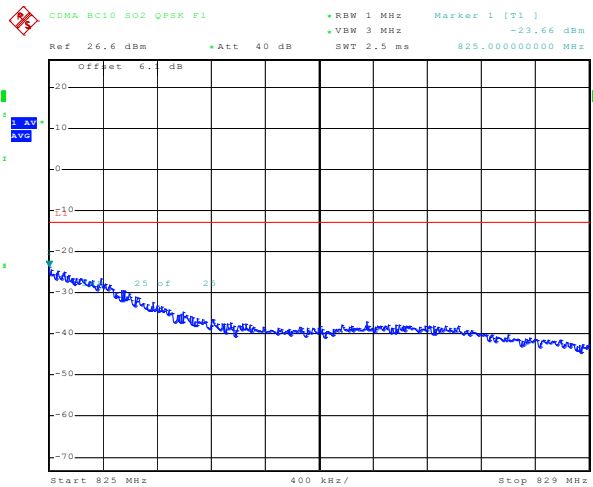
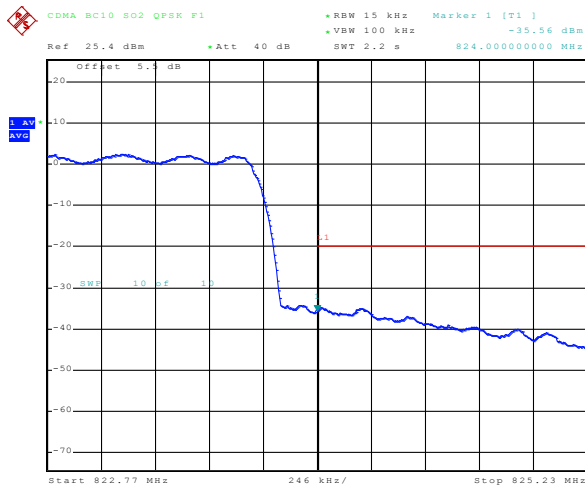
9.2.1.9 CDMA BC10, RC1, low channel, below 817 MHz (90.691 a(1),a(2))



Date: 7.FEB.2013 18:36:19

Date: 7.FEB.2013 18:36:27

9.2.1.10 CDMA BC10, RC1, high channel, above 824 MHz (90.691 a(1),a(2))

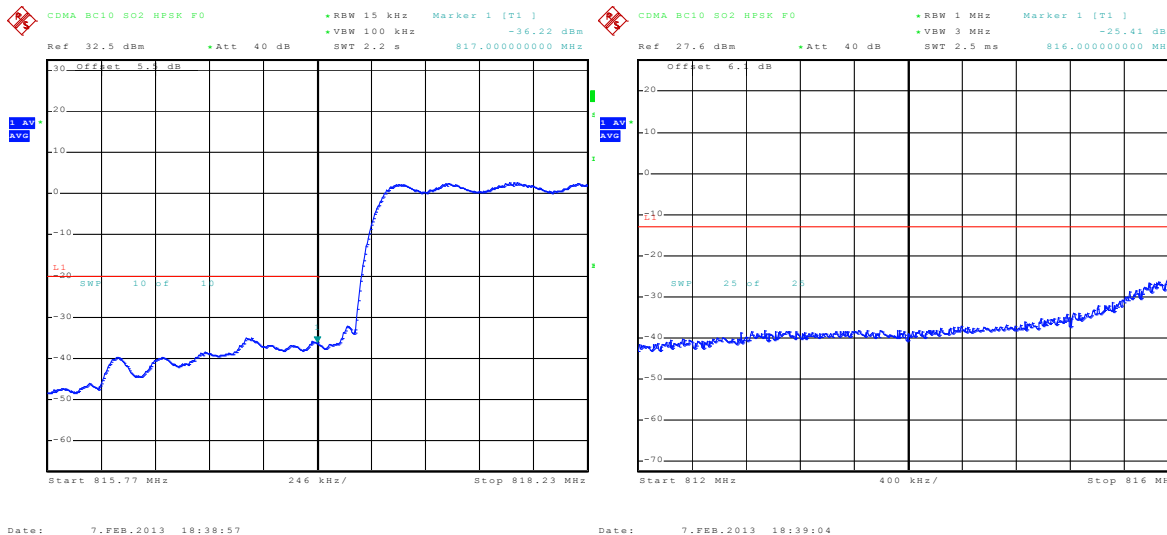


Date: 7.FEB.2013 18:37:00

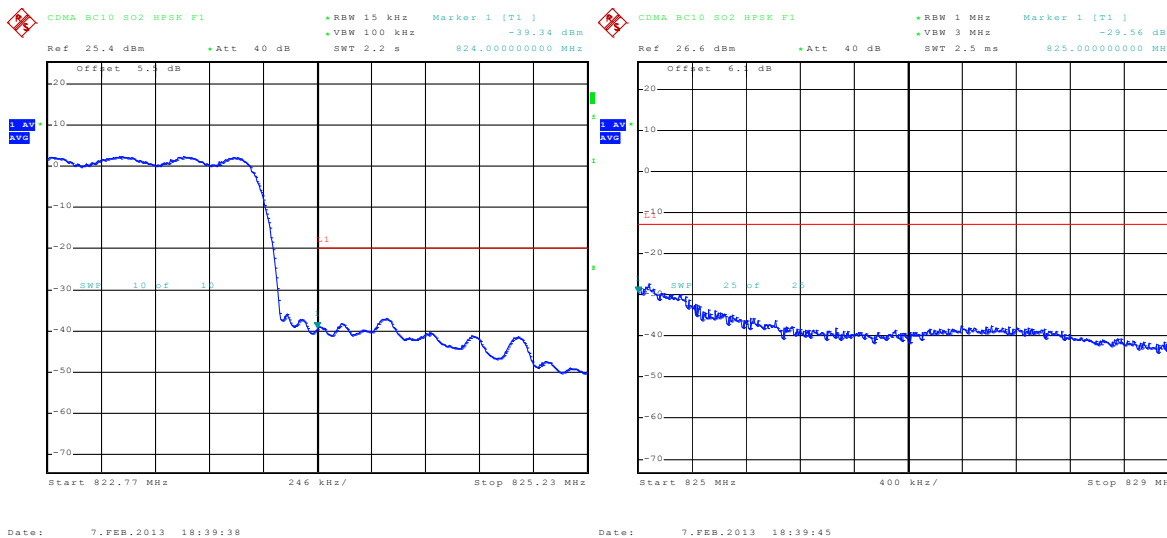
Date: 7.FEB.2013 18:37:08

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9.2.1.11 CDMA BC10, RC3, low channel, below 817 MHz(90.691 a(1),a(2))



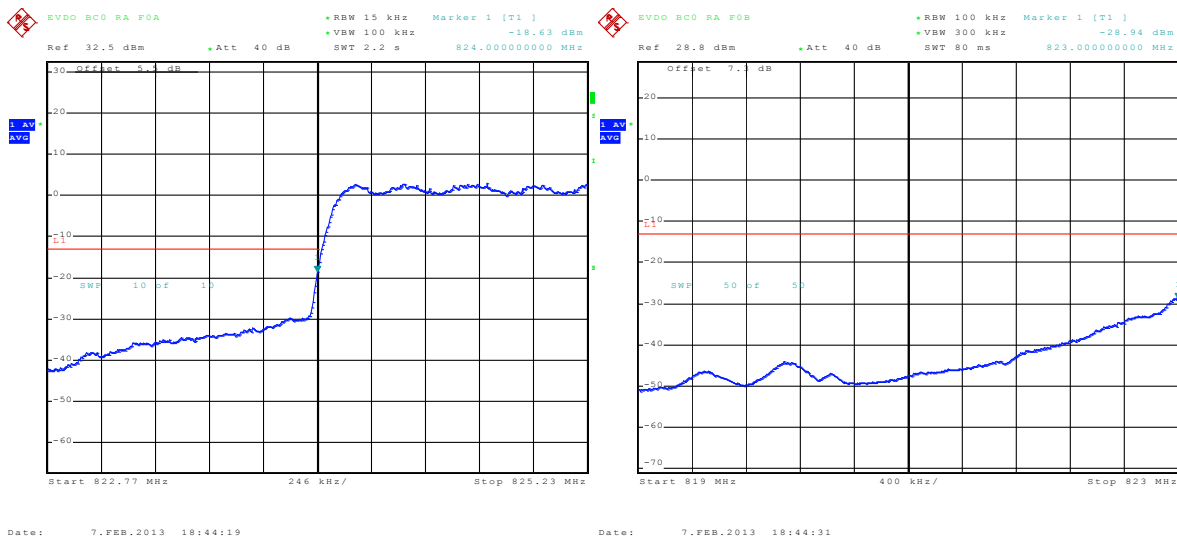
9.2.1.12 CDMA BC10, RC3, high channel, above 824 MHz(90.691 a(1),a(2))



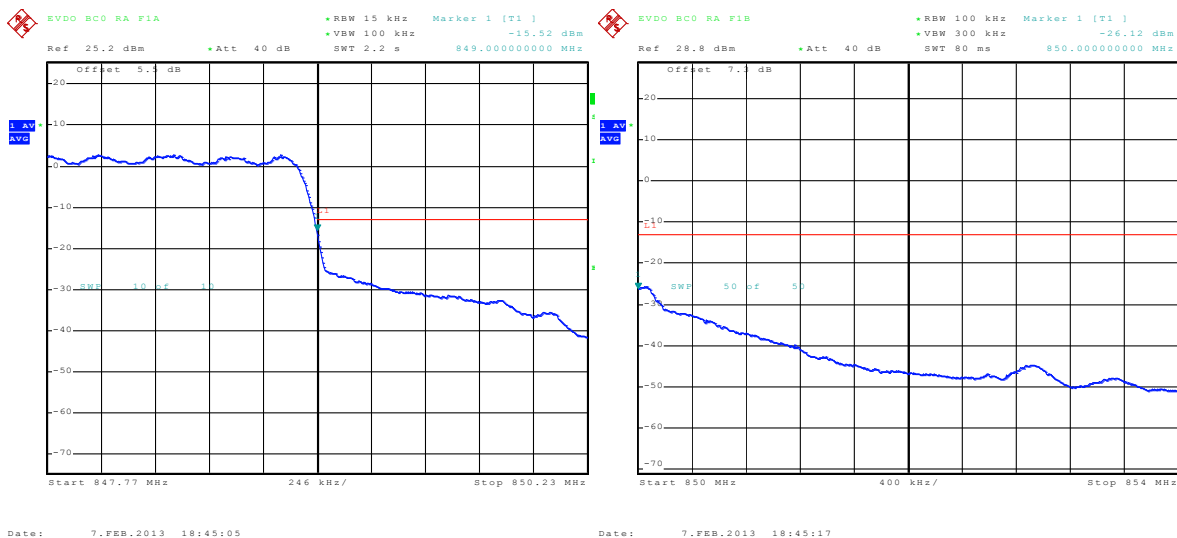
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9.2.2 1x EvDO Test Plots

9.2.2.1 1x EvDO BC0, Rel. A, low channel, below 824 MHz

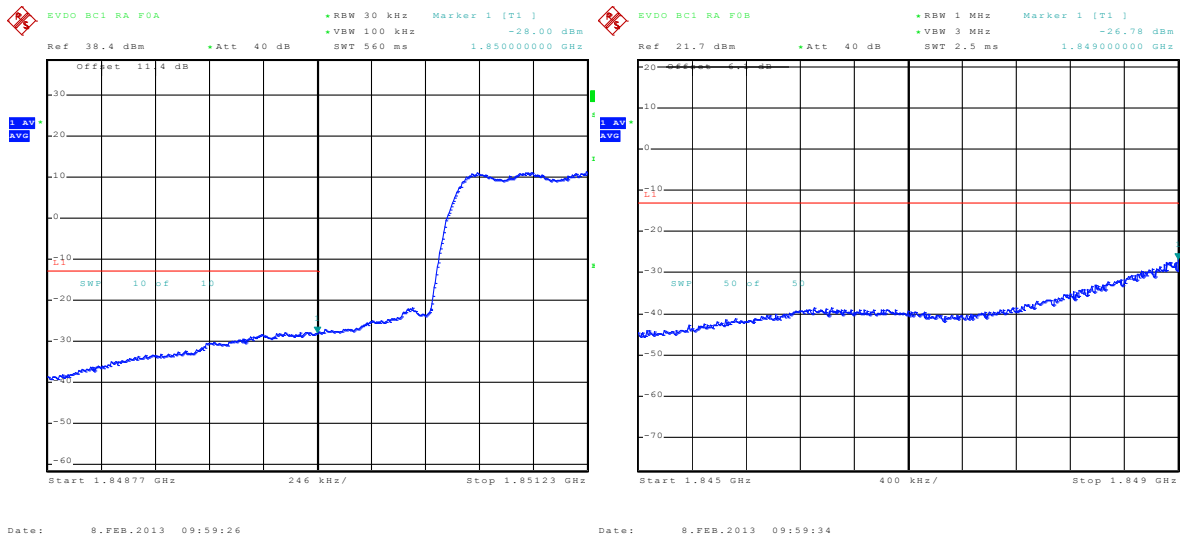


9.2.2.2 1x EvDO BC0, Rel. A, high channel, above 849 MHz

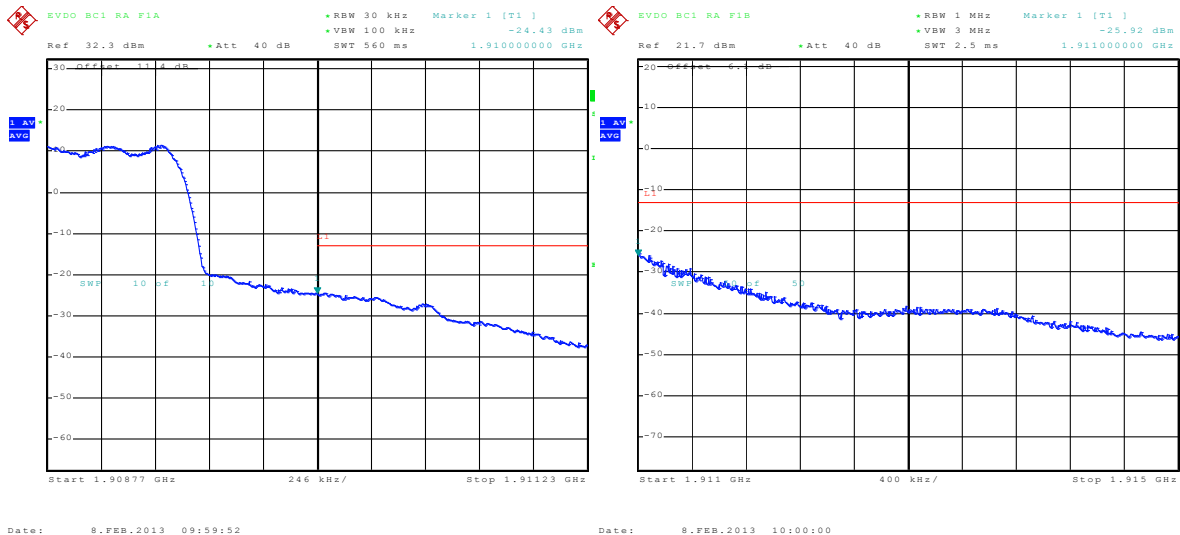


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9.2.2.3 1x EvDO BC1, Rel. A, low channel, below 1850 MHz

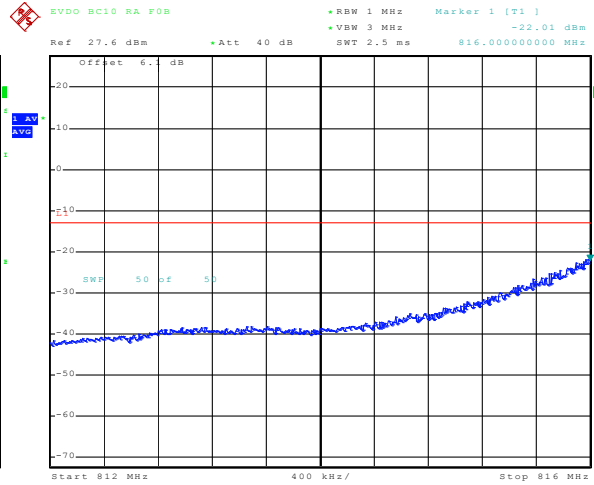
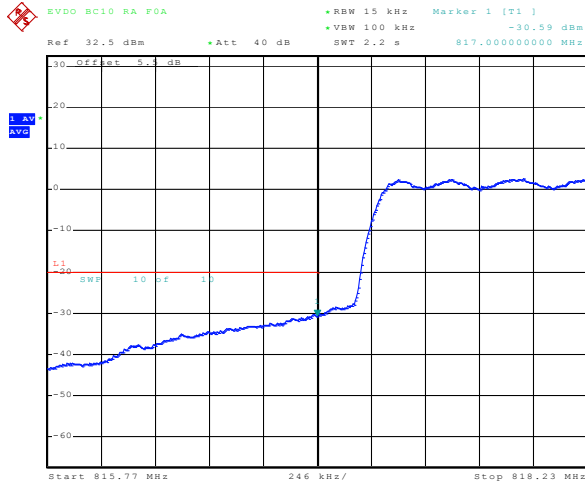


9.2.2.4 1x EvDO BC1, Rel. A, high channel, above 1910 MHz

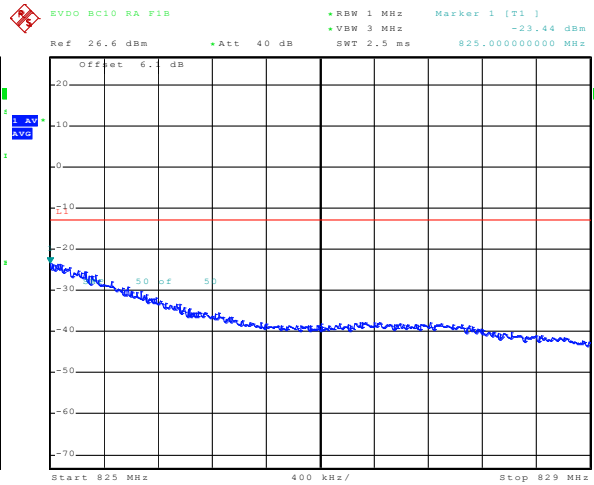
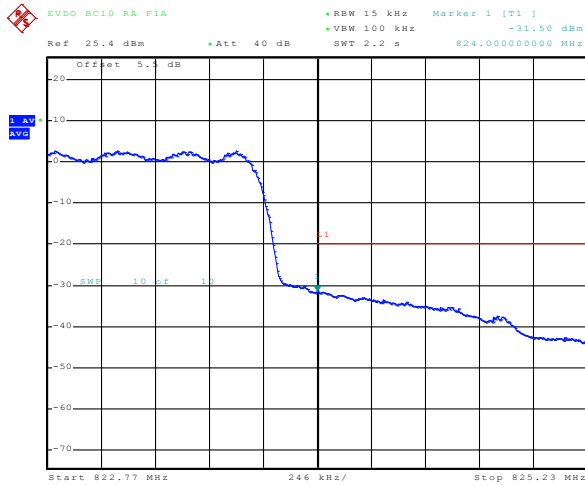


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9.2.2.5 1x EvDO BC10, Rel. A, low channel, below 817 MHz (90.691 a(1),a(2))



9.2.2.6 1x EvDO BC10, Rel. A, high channel, above 824 MHz (90.691 a(1),a(2))



10 Frequency Stability versus Temperature

FCC 2.1055, FCC 22.355, FCC 24.235, FCC 90.213

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| | | | |
|--------------------------------|--------|---------------|---------------|
| FCC Part 22/24/90, RSS-132/133 | EM7355 | Feb. 05, 2013 | Page 31 of 35 |
|--------------------------------|--------|---------------|---------------|

10.1 Summary of Results

The EUT's Frequency Stability versus temperature meets the requirements of less than 2.5ppm when temperature varies from -30°C to +50°C.

10.2 Test Procedure

The EUT was placed inside a temperature chamber. The temperature was set to -30°C and maintained to stabilize. After sufficient soak time, the transmitting frequency error was measured. The temperature was then increased by 10 degrees, maintained to stabilize, and the measurement was repeated. This procedure was repeated until +50°C is reached. Frequency metering included internal averaging of the to stabilize the reading. Reference power supply voltage for these tests is 3.7 volts. Refer to Test Setup 2.

10.3 Test Results

10.3.1 CDMA Frequency Error over Temperature

| Temp (°C) | CDMA Mode | | | | | |
|-----------|-------------|--------------|-------------|--------------|-------------|--------------|
| | BC0 | | BC1 | | BC10 | |
| | Offset (Hz) | Offset (ppm) | Offset (Hz) | Offset (ppm) | Offset (Hz) | Offset (ppm) |
| -30 | 1.5 | 0.0018 | 5.1 | 0.0027 | 1.9 | 0.0023 |
| -20 | -23.8 | -0.0289 | 3.8 | 0.0020 | 0.1 | 0.0001 |
| -10 | -53.8 | -0.0652 | 3.0 | 0.0016 | -38.3 | -0.0458 |
| 0 | -45.4 | -0.0551 | -19.4 | -0.0103 | -3.5 | -0.0042 |
| 10 | -36.6 | -0.0444 | -25.1 | -0.0134 | -18.3 | -0.0219 |
| 20 | -38.6 | -0.0468 | 3.6 | 0.0019 | -3.3 | -0.0039 |
| 30 | -3.4 | -0.0041 | -10.6 | -0.0056 | -10.9 | -0.0130 |
| 40 | -3.5 | -0.0043 | -10.3 | -0.0055 | -2.2 | -0.0026 |
| 50 | -3.2 | -0.0039 | -19.2 | -0.0102 | -2.1 | -0.0024 |

11 Frequency Stability versus Voltage

FCC 2.1055, FCC 22.355, FCC 24.235, FCC 90.213

11.1 Summary of Results

The EUT is specified to operate with a supply voltage varying between 3.0 VDC and 4.2 VDC, having a nominal voltage of 3.7 VDC. It meets the frequency stability limit of less than 2.5ppm when supply voltage varies within the specified limits. Operation above or below these voltage limits is prohibited by firmware in order to prevent improper operation.

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11.2 Test Procedure

The EUT was connected to a DC Power Supply and a CDMA test set (CMW500) with frequency error measurement capability. The power supply output was adjusted to the test voltage as measured at the input terminals to the device while transmitting. A voltmeter was used to confirm the terminal voltage. The peak frequency error is recorded (worst case). The test voltages are 3.0 volts to 4.2 volts. Refer to Test Setup 2.

11.3 Test Results

11.3.1 CDMA Frequency Error over Voltage

| Voltage (V) | CDMA Mode | | | | | |
|-------------|-------------|--------------|-------------|--------------|-------------|--------------|
| | BC0 | | BC1 | | BC10 | |
| | Offset (Hz) | Offset (ppm) | Offset (Hz) | Offset (ppm) | Offset (Hz) | Offset (ppm) |
| 3 | -22.49 | -0.0273 | -5.71 | -0.0030 | 2.05 | 0.0024 |
| 3.7 | -8.5 | -0.0103 | 2.86 | 0.0015 | -33.18 | -0.0396 |
| 4.2 | -16.11 | -0.0196 | 3.08 | 0.0016 | -1.32 | -0.0016 |

12 Peak to Average Ratio

FCC 24.232

12.1 Summary of Results

The EUT meets the requirement of having a peak to average ratio of less than 13dB.

12.2 Test Procedure

The transmitter output was connected to a Rohde & Schwarz CMW500 through a coaxial RF cable and directional coupler, and configured to operate at maximum power. The peak to average ratio was measured at the required operating frequencies in each band on the Spectrum Analyzer. Refer to Test Setup 1.

12.3 Test Results

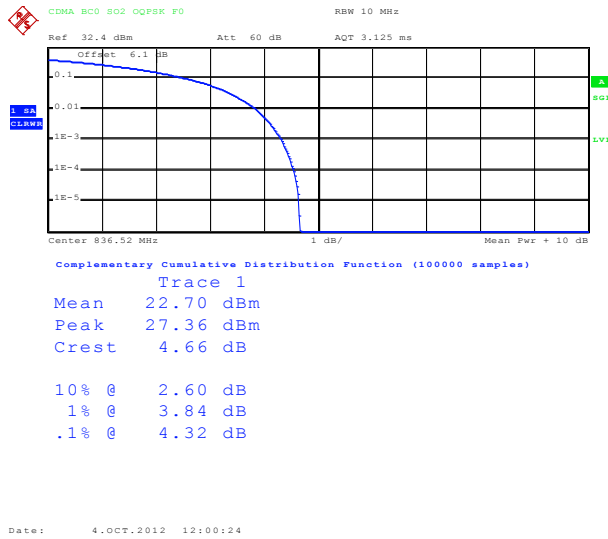
| Band | Frequency (MHz) | Channel | Modulation | Plots | Peak to Average Ratio (dB) |
|------|-----------------|---------|-------------|----------|----------------------------|
| BC0 | 836.52 | 384 | RC1 (OQPSK) | 12.3.1.1 | 4.32 |
| | | | RC3 (HPSK) | 12.3.1.2 | 3.88 |
| BC1 | 836.52 | 600 | RC1 (OQPSK) | 12.3.1.3 | 4.26 |

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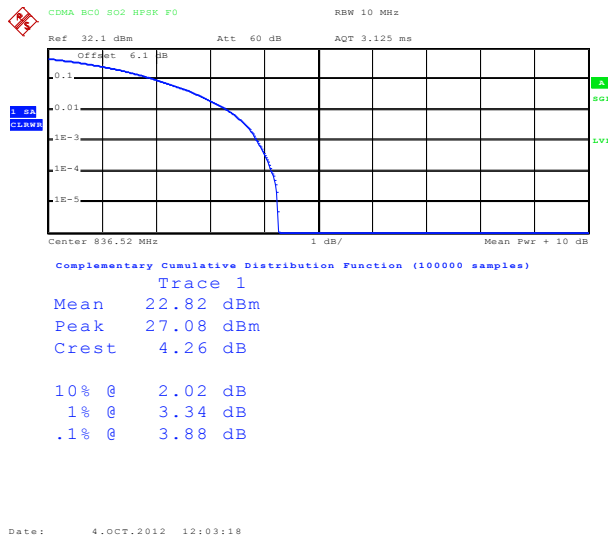
| | | | | | |
|------|--------|-----|-------------|----------|------|
| | | | RC3 (HPSK) | 12.3.1.4 | 3.86 |
| BC10 | 836.52 | 560 | RC1 (OQPSK) | 12.3.1.5 | 4.12 |
| | | | RC3 (HPSK) | 12.3.1.6 | 3.66 |

12.3.1 Test Plots

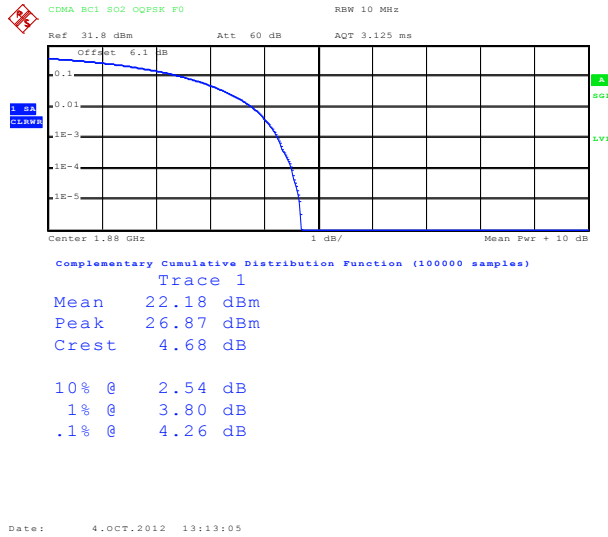
12.3.1.1 CDMA BC0, peak to average ratio, RC1, Mid channel, 836.52 MHz



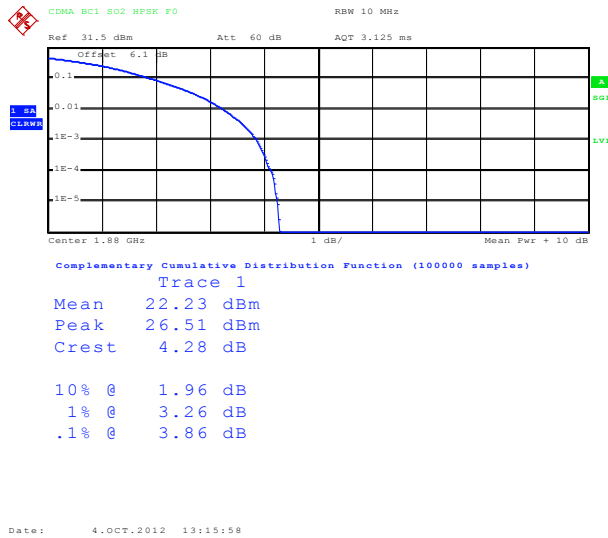
12.3.1.2 CDMA BC0, peak to average ratio, RC3, Mid channel, 836.52 MHz



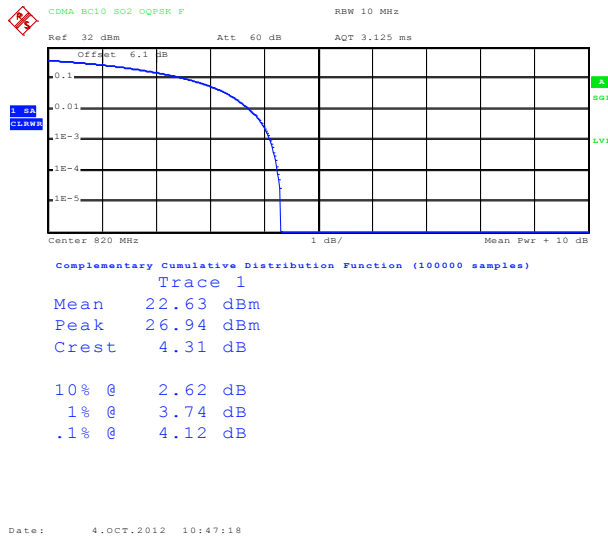
12.3.1.3 CDMA BC1, peak to average ratio, RC1, Mid channel, 1880.0MHz



12.3.1.4 CDMA BC1, peak to average ratio, RC3, Mid channel, 1880.0 MHz



12.3.1.5 CDMA BC10, peak to average ratio, RC1, Mid channel, 820.0 MHz



12.3.1.6 CDMA BC10, peak to average ratio, RC3, Mid channel, 820.0 MHz

