# TEST REPORT

of

FCC Part 22 Subpart H and Part 24 Subpart E
FCC ID: YZP-D660V

| | | |
|---|---|---|
| Equipment Under Test | : | Telematics Module |
| Model Name | : | LTD-VH1000 |
| Serial No. | : | N/A |
| Applicant | : | LG Innotek |
| Manufacturer | : | LG Innotek |
| Date of Test(s) | : | 2012. 04. 17 ~ 2012. 04. 25 |
| Date of Issue | : | 2012. 06. 04 |

In the configuration tested, the EUT complied with the standards specified above.

**Tested By:**  **Date** 2012. 06. 04

**Alvin Kim**

**Approved By**  **Date** 2012. 06. 04

**Feel Jeong**

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# 1. General information

## 1.1. Testing laboratory

SGS Korea Co., Ltd. (Gunpo laboratory)
-705, Dongchun-Dong Sooji-Gu, Yongin-Si, Kyungki-Do, South Korea.
-Wireless Div. 3FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040
www.ee.sgs.com/korea
Telephone : +82 31 428 5700
FAX : +82 31 427 2371

## 1.2. Details of applicant

Applicant : LG Innotek
Address : Square 19, 20F, Hangang-daero, Jung-Gu, Seoul, 100-714, Korea
Contact Person : Lee, Duk-Gi
Phone No. : +82 2 3777 0322

## 1.3. Description of EUT

| | |
|---|---|
| **Kind of Product** | Telematics Module |
| **Model Name** | LTD-VH1000 |
| **Serial Number** | N/A |
| **Power Supply** | DC 12 V * power source used on vehicle (module voltage: DC 3.8 V) |
| **Rated Power** | CDMA800: 24 dBm<br>CDMA1900: 24 dBm |
| **Frequency Range** | CDMA800: 824.70 ㎒ ~ 848.31 ㎒<br>CDMA1900: 1 851.25 ㎒ ~ 1 908.75 ㎒ |
| **Antenna Gain** | CDMA800: 3.204 dBi<br>CDMA1900: 1.399 dBi |
| **Support Mode** | CDMA1900 1xRTT, EV DO Release 0, EV DO Revision A |
| **Emission Designator** | CDMA800 (1xRTT):1M27F9W<br>CDMA800 (EV DO Revision A):1M28F9W<br>CDMA1900(1xRTT): 1M27F9W<br>CDMA1900 (EV DO Revision A):1M27F9W |
| **H/W Version** | EAGLE D660V-C10 |
| **S/W Version** | LTD-VH1000_0.2.0 |

## 1.4. Maximum output power

The transmitter has a maximum ERP & EIRP and Average output power as follows:

**-Cellular Band**

| Frequency Range (㎒) | Modulation | Channel | Average Output Power | | E.R.P. | |
|---|---|---|---|---|---|---|
| | | | dB m | ㎽ | dB m | ㎽ |
| 824.70 | 1xRTT RC1 55 (Loopback) | 1013 | 24.42 | 276.69 | 27.99 | 629.51 |
| 836.52 | | 384 | 24.31 | 269.77 | 25.46 | 351.56 |
| 848.31 | | 777 | 24.18 | 261.82 | 27.89 | 615.18 |
| 824.70 | EV DO Revision A FETAP 307.2 k (2 slot) | 1013 | 24.48 | 280.54 | 28.05 | 638.26 |
| 836.52 | | 384 | 24.25 | 266.07 | 26.22 | 418.79 |
| 848.31 | | 777 | 24.11 | 257.63 | 28.46 | 701.46 |

**-PCS Band**

| Frequency Range (㎒) | Modulation | Channel | Average Output Power | | E.I.R.P. | |
|---|---|---|---|---|---|---|
| | | | dB m | ㎽ | dB m | ㎽ |
| 1 851.25 | 1xRTT RC1 2 (Loopback) | 25 | 24.27 | 267.30 | 29.83 | 961.61 |
| 1 880.00 | | 600 | 24.21 | 263.63 | 28.28 | 672.98 |
| 1 908.75 | | 1175 | 24.04 | 253.51 | 28.52 | 711.21 |
| 1 851.25 | EV DO Revision A RETAP 128 rate | 25 | 24.12 | 258.23 | 30.61 | 1 150.80 |
| 1 880.00 | | 600 | 24.08 | 255.86 | 28.88 | 772.68 |
| 1 908.75 | | 1175 | 23.90 | 245.47 | 29.35 | 860.99 |

## 1.5. Worst case configuration

**-Test mode**

CDMA (800 / 1900)

We found out the test mode with the highest power level in the section of output power after we investigated average output power of all the modulations and (or) data rates for each mode. So we chose below test mode as a representative of worst case.

- CDMA 1xRTT
- CDMA EVDO Revision A (Rev A)

**-EUT position during the radiation test.**

The EUT was investigated for three types of positions “X, Y and Z” under the radiation test.
In case of CDMA800, “Z“ position of fundamental is bigger than other positions. So we confirm that worst position is “Z“ position as a representative.
In case of CDMA1900, “Z“ position of fundamental is bigger than other positions. So we confirm that worst position is “Z“ position as a representative.

## 1.6. Test equipment list

| Equipment | Manufacturer | Model | S/N | Cal Due. |
|---|---|---|---|---|
| Signal Generator | Agilent | E4440A | MY43362142 | Mar. 29, 2013 |
| Signal Generator | Agilent | 8648D | 3847M00534 | Mar. 29, 2013 |
| Signal Generator | R & S | SMR40 | 100272 | Jul. 15, 2012 |
| Mobile Test Unit | Agilent | E5515C | GB43345198 | Mar. 29, 2013 |
| Directional Coupler | KRYTAR | 152613 | 122661 | Apr. 04, 2013 |
| Attenuator | AEROFLEX/INMET | 26A-10dB | 1 | Jul. 02. 2013 |
| High Pass Filter | Wainwright | WHK1.5/15G-6SS | 4 | Mar. 30, 2013 |
| High Pass Filter | Wainwright | WHK3.0/18G-10SS | 344 | Jul. 07, 2012 |
| DC power Supply | Agilent | U8002A | MY49030063 | Jan. 03, 2013 |
| Preamplifier | H.P. | 8447F | 2944A03909 | Jul. 04, 2012 |
| Preamplifier | R & S | SCU 18 | 10117 | Jan. 02, 2013 |
| Preamplifier | MITEQ Inc. | JS44-18004000-35-8P | 1546891 | Jul. 04, 2012 |
| Test Receiver | R & S | ESU26 | 100109 | Feb. 21, 2013 |
| Bilog Antenna | SCHWARZBECK | VULB9163 | 396 | Apr. 27, 2013 |
| Horn Antenna | R & S | HF 906 | 100326 | Nov. 23, 2013 |
| Horn Antenna | SCHWARZBECK | BBHA9170 | BBHA9170223 | Jun. 30, 2012 |
| Dipole Antenna | SCHWARZBECK | VHA/UHA | 9103/9105 | May. 24, 2012 |
| Antenna Master | INN-CO | MM4000 | N.C.R. | N.C.R. |
| Turn Table | INN-CO | DS 1200 S | N.C.R. | N.C.R. |
| Anechoic Chamber | SY Corporation | L × W × H<br>(9.6 m×6.4 m×6.6 m) | N.C.R. | N.C.R. |

## 1.7. Summary of test results

The EUT has been tested according to the following specifications:

| APPLIED STANDARD : FCC Part 22, 24 | | |
|---|---|---|
| **Section in FCC part** | **Test Item** | **Result** |
| §2.1046<br>§22.913(a)<br>§24.232(b) | RF Radiated Output Power | Complied |
| §2.1053<br>§22.917(e)<br>§24.238(a) | Spurious Radiated Emission | Complied |
| §2.1046(a) | Conducted Output Power | Complied |
| §2.1049(h) (i) | Occupied Bandwidth | Complied |
| §2.1051<br>§22.917(e)<br>§24.238(a) | Spurious Emission at Antenna Terminal | Complied |
| §2.1055<br>§22.355<br>§24.235 | Frequency Stability | Complied |
| §22.917(e)<br>§24.238(a) | Band Edge | Complied |
| §1.1307<br>§2.1091 | RF Exposure Evaluation | Complied |

## 1.8. Test report revision

| Revision | Report number | Description |
|---|---|---|
| 0 | F690501/RF-RTL005496 | Initial |
| 1 | F690501/RF-RTL005496-1 | Modify RF exposure evaluation |

## 1.9. Sample calculation for offset

Where relevant, the following sample calculation is provided:

**-CDMA800**

| Frequency (㎒) | Reference Cable (dB) | Directional Coupler (dB) | Attenuator (dB) | Cable Loss (dB) | Result (dB) |
|---|---|---|---|---|---|
| 836.52 | 0.50 | 13.00 | 10.00 | 0.80 | 23.80 |

**-CDMA1900**

| Frequency (㎒) | Reference Cable (dB) | Directional Coupler (dB) | Attenuator (dB) | Cable Loss (dB) | Result (dB) |
|---|---|---|---|---|---|
| 1 880.0 | 1.00 | 13.00 | 10.00 | 1.40 | 24.40 |

**-Worst case is band edge of spurious emission and band edge for CDMA800 (1xRTT)**

| Frequency (㎒) | Reference Cable (dB) | Directional Coupler (dB) | Attenuator (dB) | Cable Loss (dB) | Result (dB) |
|---|---|---|---|---|---|
| 849.00 | 0.50 | 13.00 | 10.00 | 1.12 | 24.12 |

Remark:
Spurious reading value at high channel: -16.85 ㏈m
24.12 ㏈ – 23.80 ㏈ = 0.32 ㏈, So final reading value = -16.85 + 0.32 = -16.53 ㏈m

**-Worst case of band edge of spurious emission and band edge for CDMA1900 (1xRTT)**

| Frequency (㎒) | Reference Cable (dB) | Directional Coupler (dB) | Attenuator (dB) | Cable Loss (dB) | Result (dB) |
|---|---|---|---|---|---|
| 1910.06 | 1.00 | 13.00 | 10.00 | 1.82 | 24.82 |

Remark:
Spurious reading value at high channel: -19.03 ㏈m
24.82 ㏈ – 24.40 ㏈ = 0.82 ㏈, So final reading value = -19.03 + 0.82 = -18.21 ㏈m

**-Worst case is band edge of spurious emission and band edge for CDMA800 (EV DO Rev A)**

| Frequency (㎒) | Reference Cable (dB) | Directional Coupler (dB) | Attenuator (dB) | Cable Loss (dB) | Result (dB) |
|---|---|---|---|---|---|
| 849.00 | 0.50 | 13.00 | 10.00 | 1.12 | 24.12 |

Remark:
Spurious reading value at high channel: -15.86 ㏈m
24.12 ㏈ – 23.80 ㏈ = 0.32 ㏈, So final reading value = -15.86 + 0.32 = -15.54 ㏈m

**-Worst case of band edge of spurious emission and band edge for CDMA1900 (EV DO Rev A)**

| Frequency (㎒) | Reference Cable (dB) | Directional Coupler (dB) | Attenuator (dB) | Cable Loss (dB) | Result (dB) |
|---|---|---|---|---|---|
| 1910.15 | 1.00 | 13.00 | 10.00 | 1.82 | 24.82 |

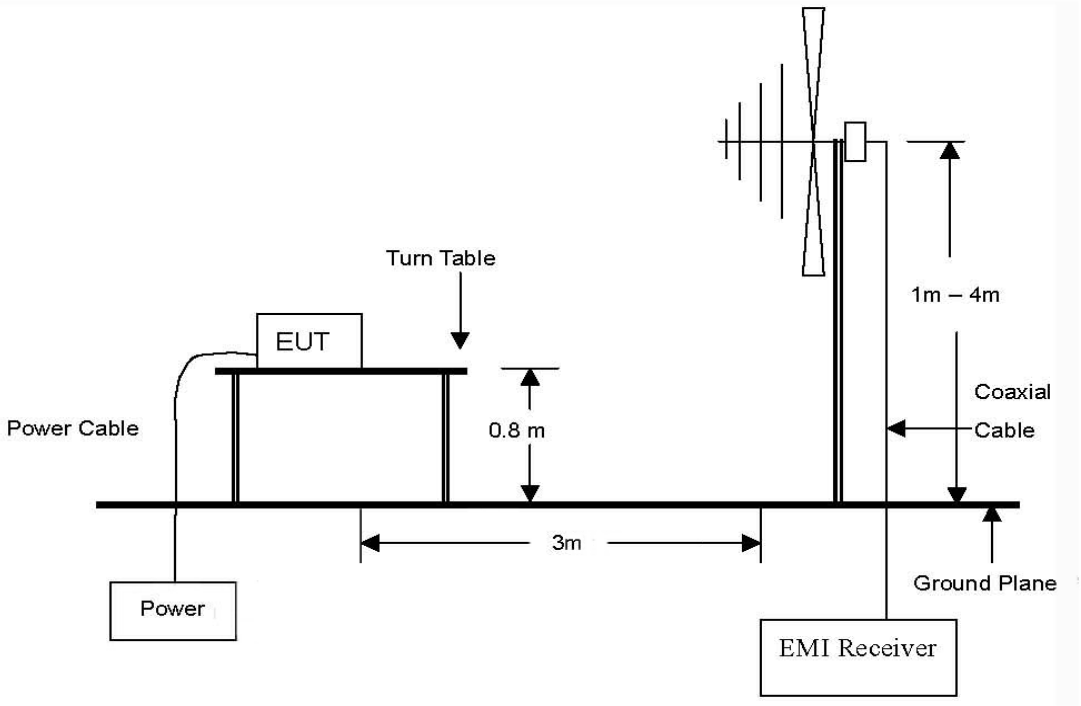
Remark:
Spurious reading value at high channel: -19.36 ㏈m
24.82 ㏈ – 24.40 ㏈ = 0.82 ㏈, So final reading value = -19.36 + 0.82 = -18.54 ㏈m

Calculation of offset value:
Result = Directional Coupler + Attenuator + Cable loss

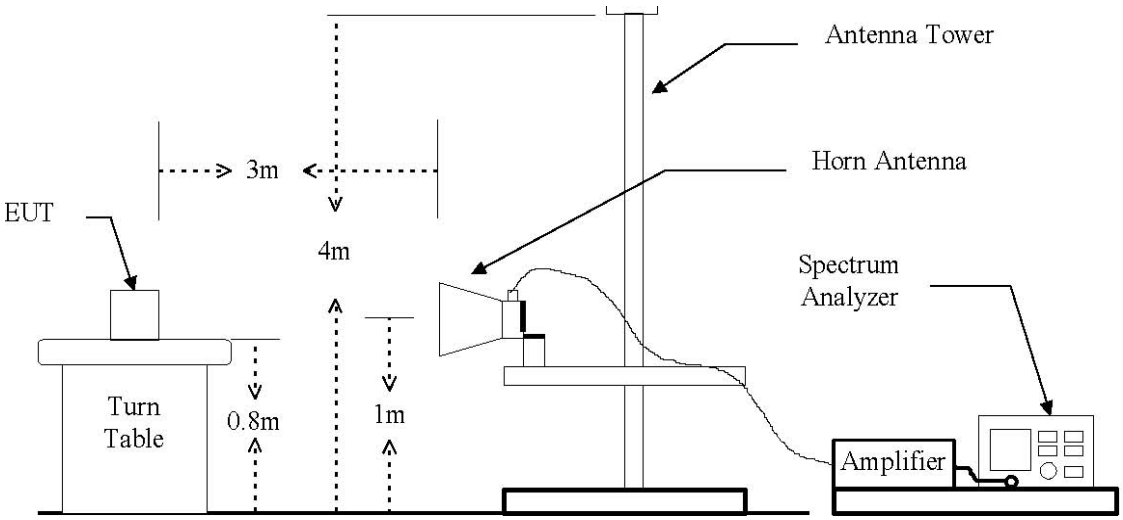
# 2. RF radiated output power & spurious radiated emission

## 2.1. Test setup

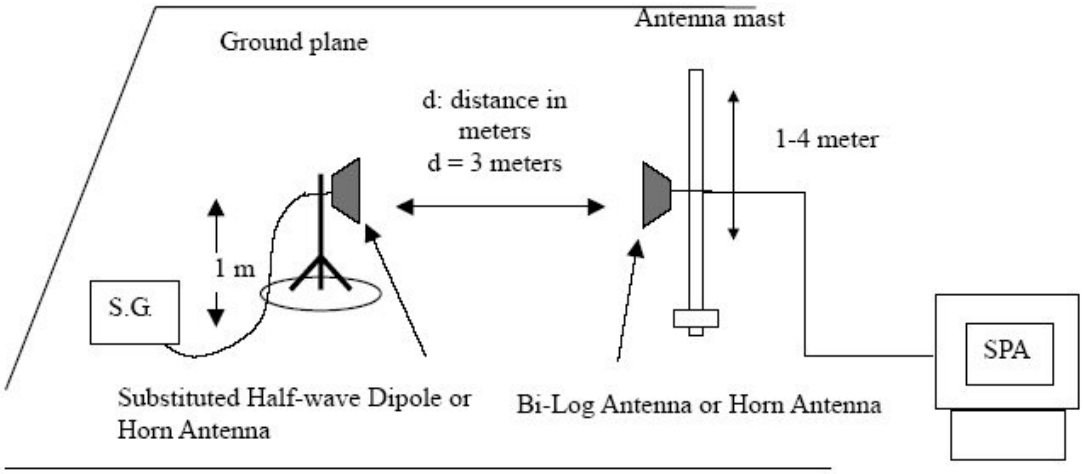
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 G㎐ Emissions.




The diagram below shows the test setup that is utilized to make the measurements for emission from 1 G㎐ to 20 ㎓ Emissions.



The diagram below shows the test setup for substituted method



## 2.2. Limit

FCC §22.913(a), the ERP of mobile transmitters must not exceed 7 watts. FCC §24.232(b) Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

## 2.3. Test procedure : Based on ANSI/TIA 603C: 2004

1. On a test site, the EUT shall be placed at 80cm height on a turn table, and in the position close to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to correspond to the fundamental frequency of the transmitter.
3. The output of the test antenna shall be connected to the measuring receiver and the peak detector is used for the measurement.
4. During the measurement of the EUT, the resolution bandwidth was to 1 ㎒ and the average bandwidth was set to 1 ㎒.
5. The transmitter shall be switched on, the measuring receiver shall be tuned to the frequency of the transmitter under test.
6. The test antenna shall be raised and lowered through the specified range of height until the maximum signal level is detected by the measuring receiver.
7. The transmitter shall be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
8. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
9. The maximum signal level detected by the measuring receiver shall be noted.
10. The EUT was replaced by half-wave dipole (824 ~ 849 ㎒) or horn antenna (1 850 ~ 1 910 ㎒) connected to a signal generator.
11. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
12. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
13. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring received, which is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
14. The input level to the substitution antenna shall be recorded as power level in ㏈m, corrected for any change of input attenuator setting of the measuring receiver.
15. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

## 2.4. Test result for RF radiated output power

Ambient temperature : (24 ± 2) ℃
Relative humidity : 47 % R.H.

**CDMA800 1xRTT mode**

| Frequency (㎒) | Ant. Pol. (H/V) | S.G level + Amp. (dB m) | Cable loss (dB) | Ant. gain (dB d) | E.R.P. | |
|---|---|---|---|---|---|---|
| | | | | | (dB m) | (㎽) |
| 824.70 | V | 29.37 | 3.42 | -3.44 | 22.51 | 178.24 |
| 824.70 | H | 34.85 | 3.42 | -3.44 | 27.99 | 629.51 |
| 836.52 | V | 29.30 | 3.38 | -3.45 | 22.47 | 176.60 |
| 836.52 | H | 32.29 | 3.38 | -3.45 | 25.46 | 351.56 |
| 848.31 | V | 31.00 | 3.34 | -3.42 | 24.24 | 265.46 |
| 848.31 | H | 34.65 | 3.34 | -3.42 | 27.89 | 615.18 |

**CDMA800 EV DO Revision A**

| Frequency (㎒) | Ant. Pol. (H/V) | S.G level + Amp. (dB m) | Cable loss (dB) | Ant. gain (dB d) | E.R.P. | |
|---|---|---|---|---|---|---|
| | | | | | (dB m) | (㎽) |
| 824.70 | V | 29.18 | 3.42 | -3.44 | 22.32 | 170.61 |
| 824.70 | H | 34.91 | 3.42 | -3.44 | 28.05 | 638.26 |
| 836.52 | V | 29.53 | 3.38 | -3.45 | 22.70 | 186.21 |
| 836.52 | H | 33.05 | 3.38 | -3.45 | 26.22 | 418.79 |
| 848.31 | V | 31.87 | 3.34 | -3.42 | 25.11 | 324.34 |
| 848.31 | H | 35.22 | 3.34 | -3.42 | 28.46 | 701.46 |

**CDMA1900 1xRTT**

| Frequency (㎒) | Ant. Pol. (H/V) | S.G level + Amp. (dB m) | Cable loss (dB) | Ant. gain (dB i) | E.I.R.P. | |
|---|---|---|---|---|---|---|
| | | | | | (dB m) | (㎽) |
| 1 851.25 | V | 27.14 | 4.87 | 7.56 | 29.83 | 961.61 |
| 1 851.25 | H | 25.75 | 4.87 | 7.56 | 28.44 | 698.23 |
| 1 880.00 | V | 23.82 | 4.91 | 7.63 | 26.54 | 450.82 |
| 1 880.00 | H | 25.56 | 4.91 | 7.63 | 28.28 | 672.98 |
| 1 908.75 | V | 25.76 | 4.94 | 7.70 | 28.52 | 711.21 |
| 1 908.75 | H | 24.30 | 4.94 | 7.70 | 27.06 | 508.16 |

**CDMA1900 EV DO Revision A**

| Frequency (㎒) | Ant. Pol. (H/V) | S.G level + Amp. (dB m) | Cable loss (dB) | Ant. gain (dB i) | E.I.R.P. | |
|---|---|---|---|---|---|---|
| | | | | | (dB m) | (㎽) |
| 1 851.25 | V | 27.92 | 4.87 | 7.56 | 30.61 | 1 150.80 |
| 1 851.25 | H | 26.91 | 4.87 | 7.56 | 29.60 | 912.01 |
| 1 880.00 | V | 24.78 | 4.91 | 7.63 | 27.50 | 562.34 |
| 1 880.00 | H | 26.16 | 4.91 | 7.63 | 28.88 | 772.68 |
| 1 908.75 | V | 26.59 | 4.94 | 7.70 | 29.35 | 860.99 |
| 1 908.75 | H | 24.99 | 4.94 | 7.70 | 27.75 | 595.66 |

*Remark:*
*1. E.R.P. & E.I.R.P = [S.G level + Amp.](dB m) - Cable loss(dB) + Ant. gain (dB d/dB i)*
*2. The E.I.R.P was measured in three orthogonal EUT position (x-axis, y-axis and z-axis). Worst cases are z -axis.*

## 2.5. Spurious radiated emission

- Measured output Power: 27.99 dBm = 0.630 W
- Modulation Signal: CDMA800 1xRTT
- Distance: 3 meters
- Limit: -(43 + 10log$_{10}$ (W)) = -40.99 dBc

| Frequency (㎒) | Ant. Pol. (H/V) | S.G level + Amp. (dBm) | Cable loss (dB) | Ant. gain (dBd) | E.R.P. (dBm) | dBc | Margin (dB) |
|---|---|---|---|---|---|---|---|
| Low Channel (824.70 ㎒) | | | | | | | |
| 1 649.45 | V | -43.62 | 4.54 | 6.44 | -41.72 | -69.71 | 28.72 |
| 1 649.45 | H | -48.09 | 4.54 | 6.44 | -46.19 | -74.18 | 33.19 |
| 2 474.79 | V | -42.25 | 5.68 | 7.98 | -39.95 | -67.94 | 26.95 |
| 2 474.79 | H | -38.48 | 5.68 | 7.98 | -36.18 | -64.17 | 23.18 |
| Middle Channel (836.52 ㎒) | | | | | | | |
| 1 672.95 | V | -39.07 | 4.58 | 6.50 | -37.15 | -65.14 | 24.15 |
| 1 672.95 | H | -42.99 | 4.58 | 6.50 | -41.07 | -69.06 | 28.07 |
| 2 508.93 | V | -40.92 | 5.72 | 8.02 | -38.62 | -66.61 | 25.62 |
| 2 508.93 | H | -40.79 | 5.72 | 8.02 | -38.49 | -66.48 | 25.49 |
| High Channel (848.31 ㎒) | | | | | | | |
| 1 697.13 | V | -32.49 | 4.62 | 6.57 | -30.54 | -58.53 | 17.54 |
| 1 697.13 | H | -39.52 | 4.62 | 6.57 | -37.57 | -65.56 | 24.57 |
| 2 544.02 | V | -38.44 | 5.75 | 8.07 | -36.12 | -64.11 | 23.12 |
| 2 544.02 | H | -37.44 | 5.75 | 8.07 | -35.12 | -63.11 | 22.12 |

- Measured output Power: 28.46 dBm =0.701 W
- Modulation Signal: CDMA800 EV DO Revision A
- Distance: 3 meters
- Limit: -(43 + 10log$_{10}$(W)) = -41.46 dBc

| Frequency (㎒) | Ant. Pol. (H/V) | S.G level + Amp. (dBm) | Cable loss (dB) | Ant. gain (dBd) | E.R.P. (dBm) | dBc | Margin (dB) |
|---|---|---|---|---|---|---|---|
| Low Channel (824.70 ㎒) | | | | | | | |
| 1 649.43 | V | -39.56 | 4.54 | 6.44 | -37.66 | -66.12 | 24.66 |
| 1 649.43 | H | -45.73 | 4.54 | 6.44 | -43.83 | -72.29 | 30.83 |
| 2 473.93 | V | -41.16 | 5.68 | 7.97 | -38.87 | -67.33 | 25.87 |
| 2 473.93 | H | -41.06 | 5.68 | 7.97 | -38.77 | -67.23 | 25.77 |
| Middle Channel (836.52 ㎒) | | | | | | | |
| 1 672.38 | V | -39.59 | 4.58 | 6.50 | -37.67 | -66.13 | 24.67 |
| 1 672.38 | H | -41.78 | 4.58 | 6.50 | -39.86 | -68.32 | 26.86 |
| 2 508.93 | V | -37.37 | 5.72 | 8.02 | -35.07 | -63.53 | 22.07 |
| 2 508.93 | H | -40.37 | 5.72 | 8.02 | -38.07 | -66.53 | 25.07 |
| High Channel (848.31 ㎒) | | | | | | | |
| 1 697.12 | V | -30.50 | 4.62 | 6.57 | -28.55 | -57.01 | 15.55 |
| 1 697.12 | H | -39.22 | 4.62 | 6.57 | -37.27 | -65.73 | 24.27 |
| 2 545.09 | V | -36.87 | 5.75 | 8.07 | -34.55 | -63.01 | 21.55 |
| 2 545.09 | H | -32.55 | 5.75 | 8.07 | -30.23 | -58.69 | 17.23 |

- Measured output Power : 29.83 dBm = 0.962 W
- Modulation Signal : CDMA1900 1xRTT
- Distance : 3 meters
- Limit : -(43 + 10log$_{10}$(W)) = -42.83 dBc

| Frequency (㎒) | Ant. Pol. (H/V) | S.G level + Amp. (dBm) | Cable loss (dB) | Ant. gain (dBi) | E.I.R.P. (dBm) | dBc | Margin (dB) |
|---|---|---|---|---|---|---|---|
| Low Channel(1 851.25 ㎒) | | | | | | | |
| 3 703.30 | V | -43.36 | 7.14 | 11.85 | -38.65 | -68.48 | 25.65 |
| 3 703.30 | H | -42.28 | 7.14 | 11.85 | -37.57 | -67.40 | 24.57 |
| 5 553.49 | V | -31.80 | 9.24 | 12.12 | -28.92 | -58.75 | 15.92 |
| 5 553.49 | H | -25.77 | 9.24 | 12.12 | -22.89 | -52.72 | 9.89 |
| Middle Channel(1 880.00 ㎒) | | | | | | | |
| 3 760.91 | V | -34.10 | 7.23 | 11.85 | -29.48 | -59.31 | 16.48 |
| 3 760.91 | H | -35.46 | 7.23 | 11.85 | -30.84 | -60.67 | 17.84 |
| 5 640.72 | V | -29.56 | 9.36 | 12.08 | -26.84 | -56.67 | 13.84 |
| 5 640.72 | H | -24.72 | 9.36 | 12.08 | -22.00 | -51.83 | 9.00 |
| High Channel(1 908.75 ㎒) | | | | | | | |
| 3 817.22 | V | -38.30 | 7.33 | 11.84 | -33.79 | -63.62 | 20.79 |
| 3 817.22 | H | -35.37 | 7.33 | 11.84 | -30.86 | -60.69 | 17.86 |
| 5 725.15 | V | -26.01 | 9.46 | 12.04 | -23.43 | -53.26 | 10.43 |
| 5 725.15 | H | -21.05 | 9.46 | 12.04 | -18.47 | -48.30 | 5.47 |

- Measured output Power : 30.61 dBm = 1.151 W
- Modulation Signal : CDMA1900 EV DO Revision A
- Distance : 3 meters
- Limit : -(43 + 10log$_{10}$(W)) = -43.61 dBc

| Frequency (MHz) | Ant. Pol. (H/V) | S.G level + Amp. (dBm) | Cable loss (dB) | Ant. gain (dBi) | E.I.R.P. (dBm) | dBc | Margin (dB) |
|---|---|---|---|---|---|---|---|
| Low Channel(1 851.25 MHz) | | | | | | | |
| 3 702.88 | V | -43.09 | 7.13 | 11.85 | -38.37 | -68.98 | 25.37 |
| 3 702.88 | H | -41.63 | 7.13 | 11.85 | -36.91 | -67.52 | 23.91 |
| 5 553.75 | V | -31.39 | 9.24 | 12.12 | -28.51 | -59.12 | 15.51 |
| 5 553.75 | H | -24.68 | 9.24 | 12.12 | -21.80 | -52.41 | 8.80 |
| Middle Channel(1 880.00 MHz) | | | | | | | |
| 3 760.67 | V | -33.02 | 7.23 | 11.85 | -28.40 | -59.01 | 15.40 |
| 3 760.67 | H | -34.64 | 7.23 | 11.85 | -30.02 | -60.63 | 17.02 |
| 5 641.04 | V | -29.28 | 9.36 | 12.08 | -26.56 | -57.17 | 13.56 |
| 5 641.04 | H | -23.22 | 9.36 | 12.08 | -20.50 | -51.11 | 7.50 |
| High Channel(1 908.75 MHz) | | | | | | | |
| 3 816.83 | V | -37.90 | 7.33 | 11.84 | -33.39 | -64.00 | 20.39 |
| 3 816.83 | H | -31.78 | 7.33 | 11.84 | -27.27 | -57.88 | 14.27 |
| 5 726.66 | V | -27.45 | 9.46 | 12.04 | -24.87 | -55.48 | 11.87 |
| 5 726.66 | H | -19.38 | 9.46 | 12.04 | -16.80 | -47.41 | 3.80 |

*Remark:*
*1. E.R.P. & E.I.R.P = S.G level (dBm) - Cable loss (dB) + Ant. gain (dBd/dBi)*
*2. No more harmonic above 3rd harmonic for all channel.*

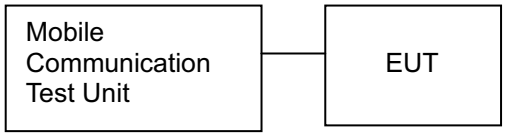
# 3. Conducted Output Power

## 3.1. Limit

Requirements: CFR 47, Section §2.1046

## 3.2. Test Procedure

1. The RF output of the transmitter was connected to the input of the Mobile Communication Test Unit through sufficient attenuation.
2. The mobile was set up for the max. output power with pseudo random data modulation.
3. The power was measured with Mobile Communication Test unit.




## 3.3.Test Settings

### 3.3.1. CDMA2000 1xRTT

- Protocol Rev > 6 (IS-2000-0)
- System ID: 8; NID:65535; Reg. Ch. #. 384(Cell) & 600(PCS)
- Radio Config (RC) > Please see following table for details
- FCH Service Option (SO) Setup > Please see following table for details
- Traffic Data Rate > Full
- TDSO SCH info > F-SCH parameters > F-SCH Data Rate > 153.6kbps
  >R-SCH Parameters > R-SCH Data Rate > 153.6kbps
- RVS Power Ctrl > All Up bits (Maximum TxPout)

### 3.3.2. CDMA2000 Ev-Do

EVDO Release 0 - RTAP
- Call Setup > Shift & Preset
- Call Control
  Access Network Info > Cell Parameters > Sector ID > 00000000 : 00000000 : 00000000: 00000000 > Subnet Mask > 0
- Generator Info > Termination Parameters > Max Forward Packet Duration > 16 Slots
- Call Parms:
  Cell Power > -105.5 dB m/1.23 ㎒
  Cell Band > (Select US Cellular or US PCS)
  Channel > (Enter channel number)
  Application Config > Enhanced Test Application Protocol > RTAP
  RTAP Rate > 153.6kbps
  Rvs Power Ctrl > Active bits
  Protocol Rel > 0 (1xEV-DO)
- Press " Start Data Connection" when "Session Open" appear in "Active Cell"
- Rvs Power Ctrl > All Up bits (Maximum TxPout)

EVDO Release 0 – FTAP
- Call Setup > Shift & Preset
- Call Control:
  Access Network Info > Cell Parameters > Sector ID > 0000000 : 00000000 : 00000000 : 00000000 > Subnet Mask > 0
  Generator Info > Termination Parameters > Max Forward Packet Duration > 16 Slots
- Call Parms
  Cell Power > -105.5 dB m/1.23 ㎒
  Cell Band > (Select US Cellular or US PCS)
  Channel > (Enter channel number)
  Application Config > Enhanced Test Application Protocol > FTAP (default)
  FTAP Rate > 307.2kbps (2 Slot, QPSK)
  Rvs Power Ctrl > Active bits
  Protocol Rel > 0 (1xEV-DO)
- Press " Start Data Connection" when "Session Open" appear in "Active Cell"
- Rvs Power Ctrl > All Up bits (Maximum TxPout)

### 3.3.2. CDMA2000 Ev-Do Rev.A

EVDO Rev.A – RETAP
- Call Setup > Shift & Preset
- Cell Power > -60 dB m/1.23 ㎒
- Protocol Rev > A (1xEV-DO-A)
- Application Config > Enhanced Test Application Protocol > RETAP
- R-Data Pkt Size > 4096
- Protocol Subtype Config > Release A Physical Layer Subtype > Subtype 2 > PL Subtype 2 Access Channel MAC Subtype > Default ( Subtype 0)
- Access Network Info > Cell Parameters > Sector ID > 00000000 : 00000000 : 00000000 : 00000000 : Subnet Mask > 0
- Generator > Termination Parameters > Max Forward Packet Duration > 16 Slots > ACK R-Data After > Subpacket 0 (All ACK)
- Rvs Power Ctrl > All Up bits ( to get the maximum power)

EVDO Rev.A – FETAP
- Call Setup > Shift & Preset
- Cell Power > -60 dB m/1.23 ㎒
- Protocol Rev > A (1xEV-DO-A)
- Application Config > Enhanced Test Application Protocol > FETAP
- F-Traffic Format > 4 (1024,2,128) Canonical (307.2K, QPSK)
- Protocol Subtype Config > Release A Physical Layer Subtype > Subtype2 > PL Subtype2 Access Channel MAC Subtype > Default (Subtype 0)
- Access Network Info > Termination Parameters > Max Forward Packet Duration > 16 Slots > ACK R-Data After > Subpacket0 (All ACK)
- Rvs Power Ctrl > All Up bits (to get the maximum power)

## 3.4. Test Result

Ambient temperature : (24 ± 2) ℃
Relative humidity : 47 % R.H.

### 3.4.1. CDMA2000 1xRTT

**-Cellular Band**

| Radio Configuration (RC) | Sevice Option (SO) | Average Output Power (dBm) | | |
|---|---|---|---|---|
| | | Ch. 1013 / 824.70 ㎒ | Ch. 384 / 836.52 ㎒ | Ch. 777 / 848.31 ㎒ |
| RC1 | 2 (Loopback) | 24.36 | 24.15 | 24.10 |
| | 55 (Loopback) | **24.42** | 24.31 | 24.18 |
| RC2 | 9 (Loopback) | 24.38 | 24.16 | 24.13 |
| | 55 (Loopback) | 24.37 | 24.10 | 24.16 |
| RC3 | 2 (Loopback) | 24.28 | 24.06 | 24.03 |
| | 55 (Loopback) | 24.31 | 24.07 | 24.05 |
| | 32 (+F-SCH) | 24.26 | 24.08 | 24.01 |
| | 32 (+SCH) | 24.29 | 24.11 | 24.03 |
| RC4 | 2 (Loopback) | 24.28 | 24.05 | 24.03 |
| | 55 (Loopback) | 24.27 | 24.07 | 24.01 |
| | 32 (+F-SCH) | 24.29 | 24.08 | 24.02 |
| | 32 (+SCH) | 24.27 | 24.05 | 24.03 |
| RC5 | 9 (Loopback) | 24.31 | 24.09 | 24.04 |
| | 55 (Loopback) | 24.34 | 24.07 | 24.06 |

- The measurement is average output power for Low, Middle and High channel.
- The **service option 55 of RC1** of worst case is bigger than other power compared with each service option.

## -PCS Band

| Radio Configuration (RC) | Sevice Option (SO) | Average Output Power (dB m) | | |
|---|---|---|---|---|
| | | Ch. 25 / 1 851.25 ㎒ | Ch. 600 / 1 880.00 ㎒ | Ch. 1175 / 1 908.75 ㎒ |
| RC1 | 2 (Loopback) | **24.27** | 24.21 | 24.04 |
| | 55 (Loopback) | 24.24 | 24.24 | 24.04 |
| RC2 | 9 (Loopback) | 24.23 | 24.22 | 24.02 |
| | 55 (Loopback) | 24.25 | 24.23 | 24.01 |
| RC3 | 2 (Loopback) | 24.17 | 24.14 | 23.98 |
| | 55 (Loopback) | 24.20 | 24.17 | 23.98 |
| | 32 (+F-SCH) | 24.18 | 24.15 | 24.02 |
| | 32 (+SCH) | 24.20 | 24.18 | 24.02 |
| RC4 | 2 (Loopback) | 24.16 | 24.15 | 23.97 |
| | 55 (Loopback) | 24.17 | 24.17 | 24.00 |
| | 32 (+F-SCH) | 24.18 | 24.15 | 23.98 |
| | 32 (+SCH) | 24.18 | 24.15 | 24.00 |
| RC5 | 9 (Loopback) | 24.16 | 24.19 | 24.02 |
| | 55 (Loopback) | 24.15 | 24.16 | 24.00 |

- The measurement is average output power for Low, Middle and High channel.
- The **service option 2 of RC1** of worst case is bigger than other power compared with each service option.

### 3.4.2. CDMA2000 1xEV DO Release 0

#### -Cellular Band

| Channel | Frequency (㎒) | RTAP | | FTAP | |
|---|---|---|---|---|---|
| | | RTAP Rate | Average Output Power(㏈m) | FTAP Rate | Average Output Power(㏈m) |
| 1013 | 824.70 | 9.6 | 24.42 | 307.2 Kbps (2slot, QPSK) | **24.47** |
| | | 19.2 | 24.40 | | |
| | | 38.4 | 24.38 | | |
| | | 76.8 | 24.36 | | |
| | | 153.6 | 24.34 | | |
| 384 | 836.52 | 9.6 | 24.21 | 307.2 Kbps (2slot, QPSK) | 24.19 |
| | | 19.2 | 24.15 | | |
| | | 38.4 | 24.12 | | |
| | | 76.8 | 24.09 | | |
| | | 153.6 | 24.16 | | |
| 777 | 848.31 | 9.6 | 24.11 | 307.2 Kbps (2slot, QPSK) | 24.07 |
| | | 19.2 | 24.10 | | |
| | | 38.4 | 24.09 | | |
| | | 76.8 | 23.96 | | |
| | | 153.6 | 24.03 | | |

- The measurement is average output power for Low, Middle and High channel.
- The **FTAP** of worst case is bigger than other power compared with each service option.

#### -PCS Band

| Channel | Frequency (㎒) | RTAP | | FTAP | |
|---|---|---|---|---|---|
| | | RTAP Rate | Average Output Power(㏈m) | FTAP Rate | Average Output Power(㏈m) |
| 25 | 1 851.25 | 9.6 | **24.11** | 307.2 Kbps (2slot, QPSK) | 24.08 |
| | | 19.2 | 24.10 | | |
| | | 38.4 | 24.09 | | |
| | | 76.8 | 24.08 | | |
| | | 153.6 | 24.08 | | |
| 600 | 1 880.00 | 9.6 | 24.01 | 307.2 Kbps (2slot, QPSK) | 24.10 |
| | | 19.2 | 24.00 | | |
| | | 38.4 | 24.00 | | |
| | | 76.8 | 24.01 | | |
| | | 153.6 | 24.01 | | |
| 1175 | 1 908.75 | 9.6 | 23.88 | 307.2 Kbps (2slot, QPSK) | 23.91 |
| | | 19.2 | 23.88 | | |
| | | 38.4 | 23.86 | | |
| | | 76.8 | 23.87 | | |
| | | 153.6 | 23.85 | | |

- The measurement is average output power for Low, Middle and High channel.
- The **9.6 rate of RTAP** of worst case is bigger than other power compared with each service option.

### 3.4.3. CDMA2000 1xEV DO Revision A

**-Cellular Band**

| Channel | Frequency (㎒) | RETAP | | FETAP | |
|---|---|---|---|---|---|
| | | RETAP Rate | Average Output Power(㏈m) | FETAP Rate | Average Output Power(㏈m) |
| 1013 | 824.70 | 128 | 24.40 | 307.2 k (2 slot) | **24.48** |
| | | 256 | 24.42 | | |
| | | 512 | 24.42 | | |
| | | 768 | 24.42 | | |
| | | 1024 | 24.41 | | |
| | | 1536 | 24.40 | | |
| | | 2048 | 24.41 | 307.2 k (4 slot) | 24.47 |
| | | 3072 | 24.39 | | |
| | | 4096 | 24.40 | | |
| | | 6144 | 24.46 | | |
| | | 8192 | 24.38 | | |
| | | 12288 | 24.41 | | |
| 384 | 836.52 | 128 | 24.20 | 307.2 k (2 slot) | 24.25 |
| | | 256 | 24.22 | | |
| | | 512 | 24.22 | | |
| | | 768 | 24.21 | | |
| | | 1024 | 24.21 | | |
| | | 1536 | 24.19 | | |
| | | 2048 | 24.19 | 307.2 k (4 slot) | 24.23 |
| | | 3072 | 24.19 | | |
| | | 4096 | 24.17 | | |
| | | 6144 | 24.17 | | |
| | | 8192 | 24.18 | | |
| | | 12288 | 24.18 | | |
| 777 | 848.31 | 128 | 24.08 | 307.2 k (2 slot) | 24.11 |
| | | 256 | 24.10 | | |
| | | 512 | 24.11 | | |
| | | 768 | 24.10 | | |
| | | 1024 | 24.10 | | |
| | | 1536 | 24.08 | | |
| | | 2048 | 24.08 | 307.2 k (4 slot) | 24.10 |
| | | 3072 | 24.06 | | |
| | | 4096 | 24.05 | | |
| | | 6144 | 24.04 | | |
| | | 8192 | 24.04 | | |
| | | 12288 | 24.05 | | |

- The measurement is average output power for Low, Middle and High channel.
- The **FETAP** of worst case is bigger than other power compared with each service option.

## -PCS Band

| Channel | Frequency (㎒) | RETAP | | FETAP | |
|---|---|---|---|---|---|
| | | RETAP Rate | Average Output Power(㏈m) | FETAP Rate | Average Output Power(㏈m) |
| 25 | 1 851.25 | 128 | **24.12** | 307.2 k (2 slot) | 24.06 |
| | | 256 | 24.11 | | |
| | | 512 | 24.11 | | |
| | | 768 | 24.10 | | |
| | | 1024 | 24.10 | | |
| | | 1536 | 24.09 | | |
| | | 2048 | 24.09 | 307.2 k (4 slot) | 24.07 |
| | | 3072 | 24.08 | | |
| | | 4096 | 24.09 | | |
| | | 6144 | 24.08 | | |
| | | 8192 | 24.07 | | |
| | | 12288 | 24.06 | | |
| 600 | 1 880.00 | 128 | 24.08 | 307.2 k (2 slot) | 24.07 |
| | | 256 | 24.09 | | |
| | | 512 | 24.02 | | |
| | | 768 | 24.01 | | |
| | | 1024 | 24.02 | | |
| | | 1536 | 24.01 | | |
| | | 2048 | 24.03 | 307.2 k (4 slot) | 24.07 |
| | | 3072 | 24.07 | | |
| | | 4096 | 24.08 | | |
| | | 6144 | 24.01 | | |
| | | 8192 | 24.03 | | |
| | | 12288 | 24.04 | | |
| 1175 | 1 908.75 | 128 | 23.90 | 307.2 k (2 slot) | 23.89 |
| | | 256 | 23.91 | | |
| | | 512 | 23.82 | | |
| | | 768 | 23.91 | | |
| | | 1024 | 23.91 | | |
| | | 1536 | 23.90 | | |
| | | 2048 | 23.89 | 307.2 k (4 slot) | 23.88 |
| | | 3072 | 23.86 | | |
| | | 4096 | 23.86 | | |
| | | 6144 | 23.86 | | |
| | | 8192 | 23.91 | | |
| | | 12288 | 23.92 | | |

- The measurement is average output power for Low, Middle and High channel.
- The **128 rate of RETAP** of worst case is bigger than other power compared with each service option.

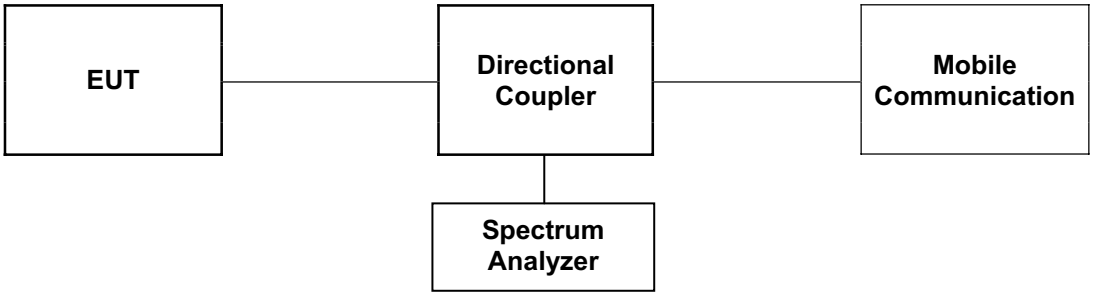
# 4. Occupied Bandwidth 99 %

## 4.1. Limit

Requirements: CFR 47, Section §2.1049.

## 4.2. Test Procedure

1. The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.
2. The resolution bandwidth of the spectrum analyzer was set.
   Occupied Bandwidth 99 % was tested under



## 4.3 Test Results

Ambient temperature : (24 ± 2) ℃
Relative humidity : 47 % R.H.

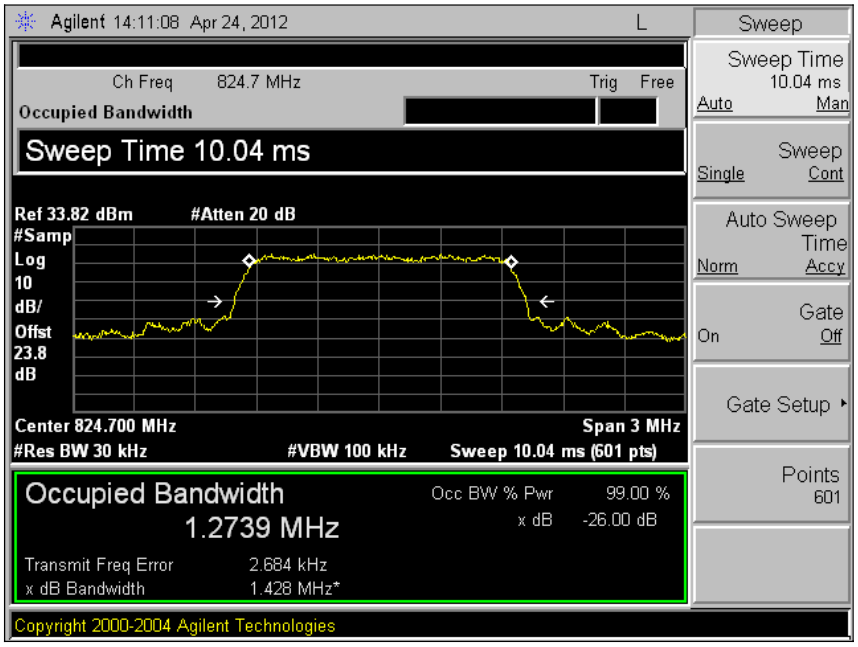
| Band | Mode | Frequency (㎒) | Occupied Bandwidth (㎒) |
|---|---|---|---|
| CDMA800 | 1xRTT RC1 55 (Loopback) | 824.70 | 1.274 |
| | | 836.52 | 1.267 |
| | | 848.31 | 1.270 |
| | EV DO Revision A FETAP 307.2 k (2 slot) | 824.70 | 1.276 |
| | | 836.52 | 1.276 |
| | | 848.31 | 1.273 |
| CDMA1900 | 1xRTT RC1 2 (Loopback) | 1 851.25 | 1.269 |
| | | 1 880.00 | 1.264 |
| | | 1 908.75 | 1.272 |
| | EV DO Revision A RETAP 128 rate | 1 851.25 | 1.269 |
| | | 1 880.00 | 1.268 |
| | | 1 908.75 | 1.268 |

Please refer to the following plots.

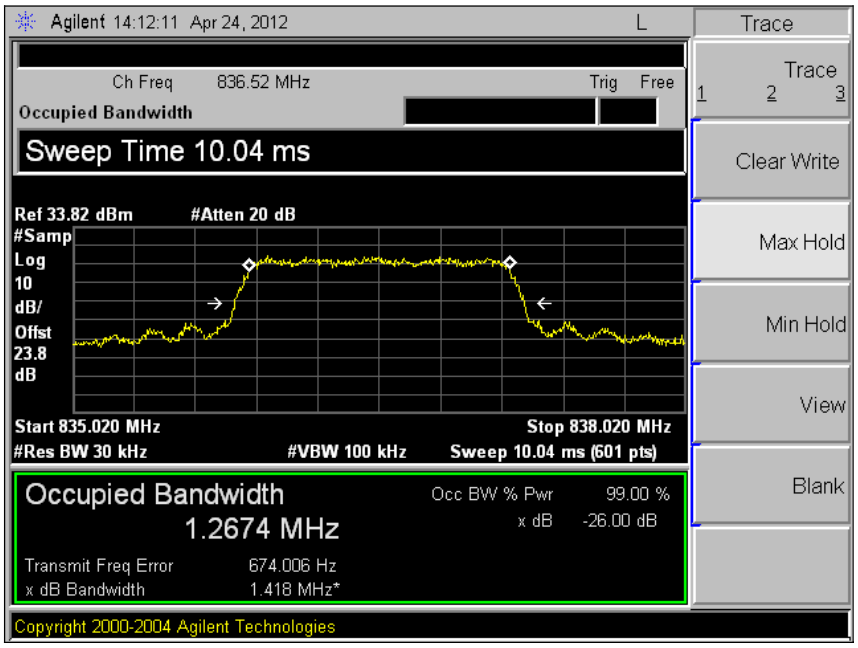
**CDMA800**

**1xRTT**

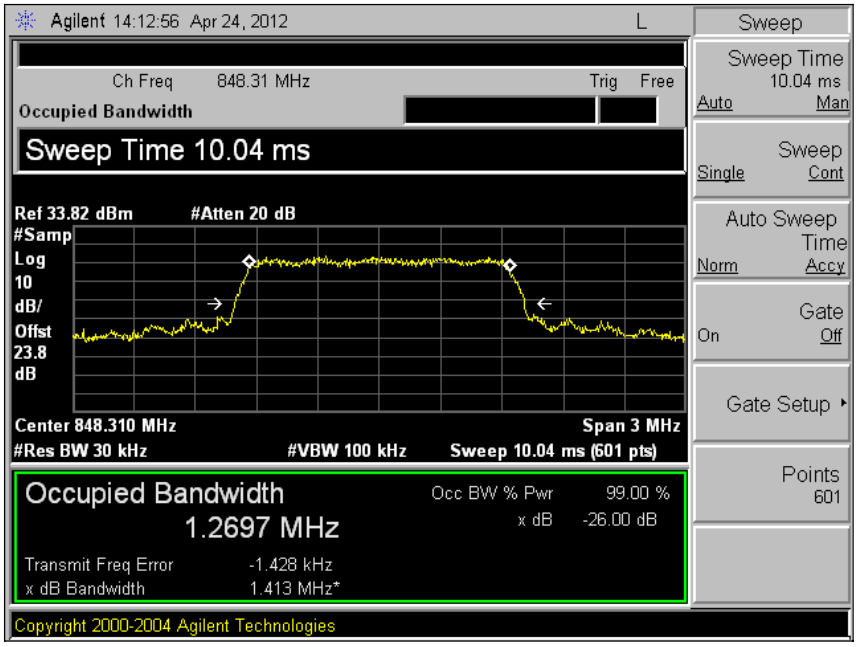
Low Channel




Middle Channel



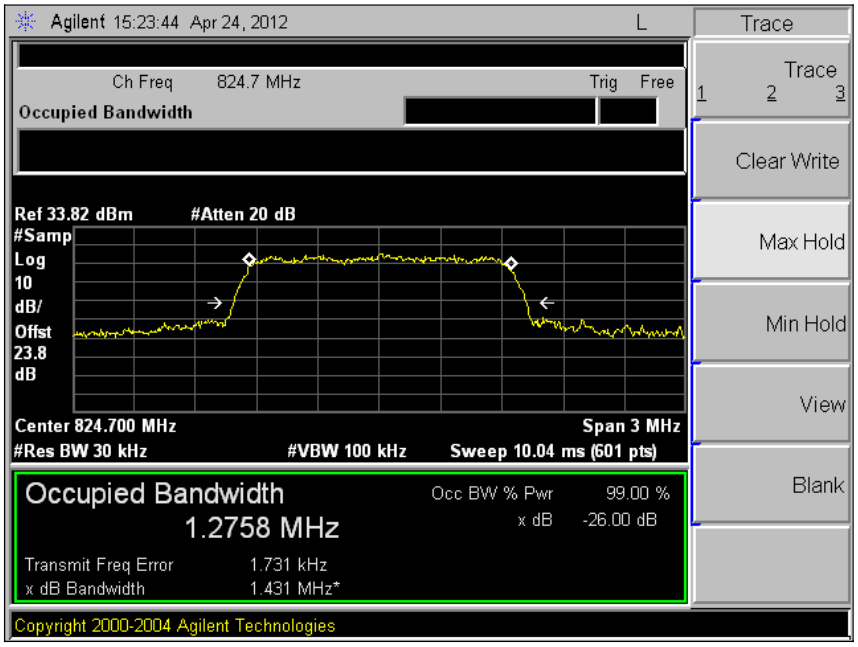
High Channel



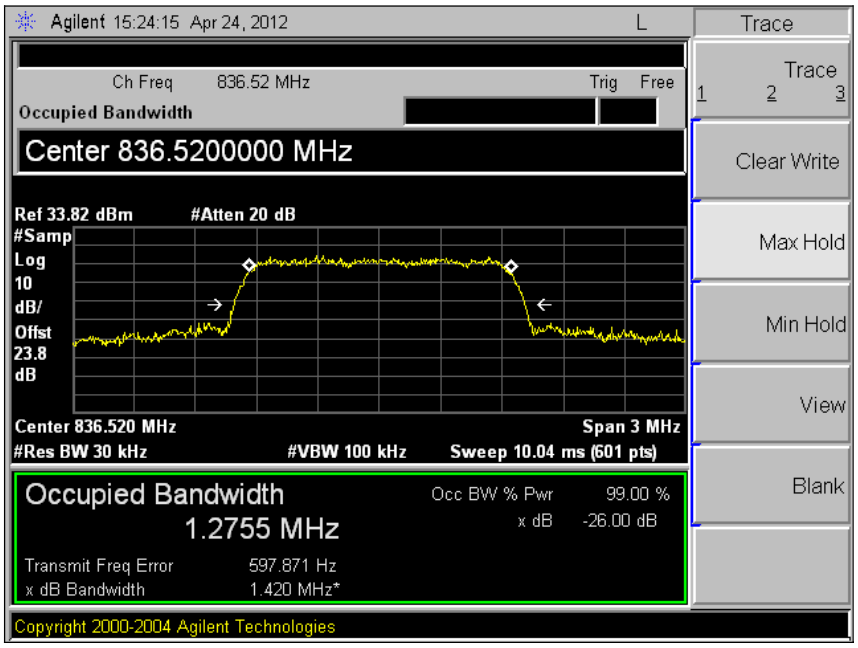
**CDMA800**

**EV DO Revision A**

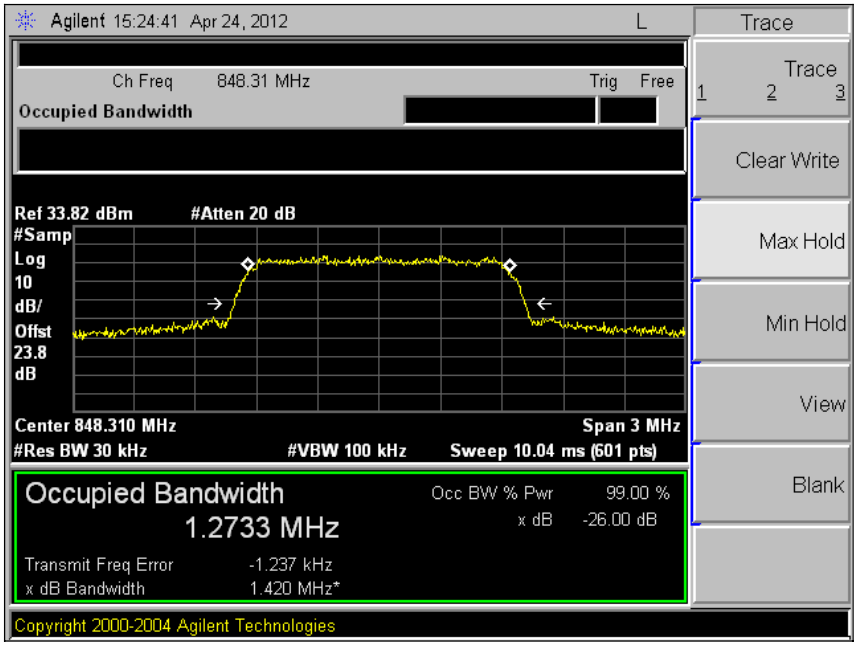
Low Channel




Middle Channel



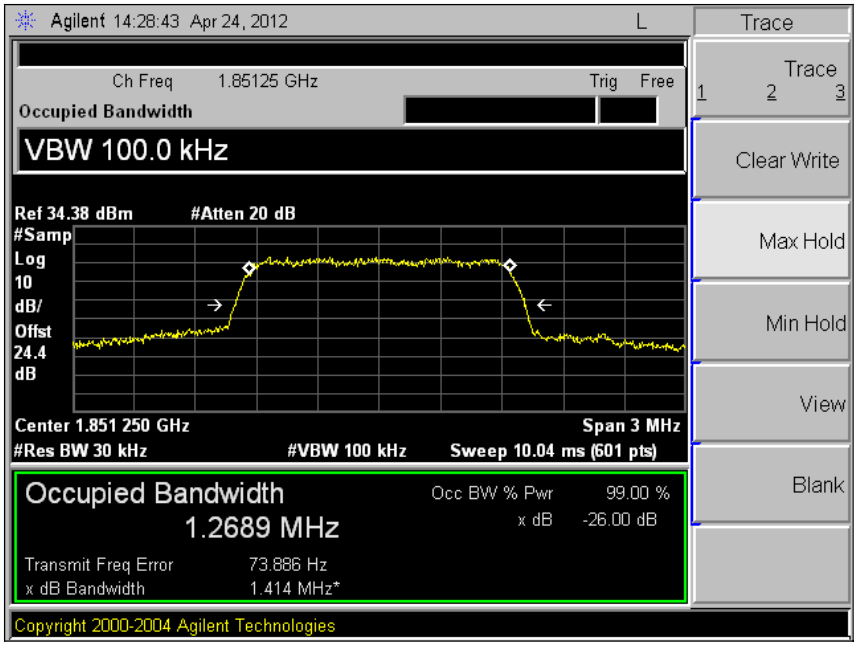
High Channel



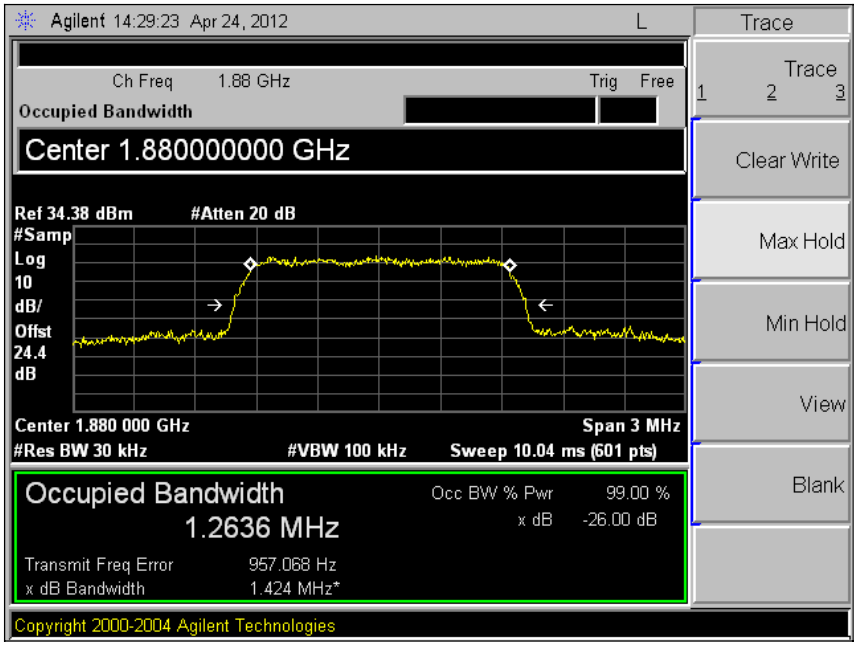
**CDMA1900**

**1xRTT**

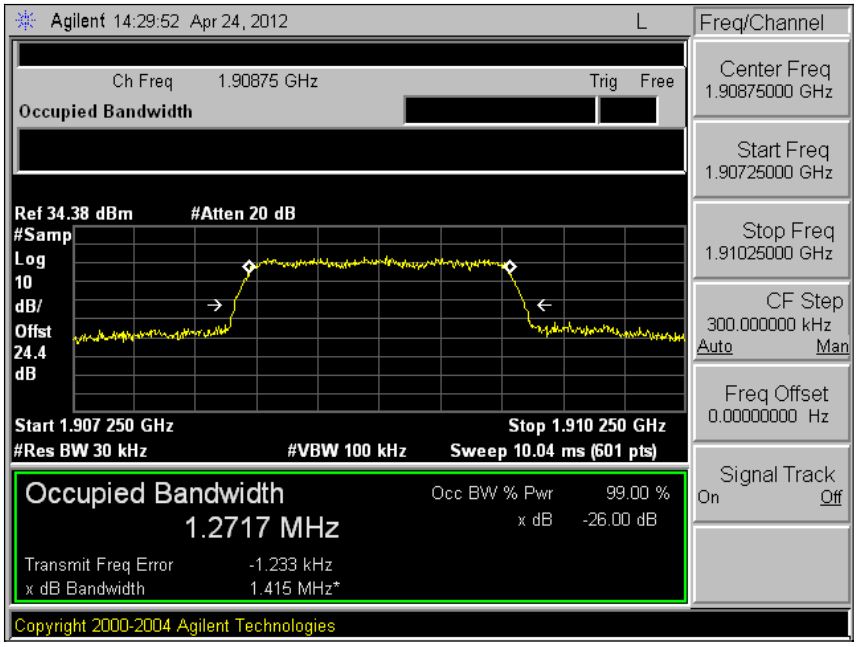
Low Channel




Middle Channel



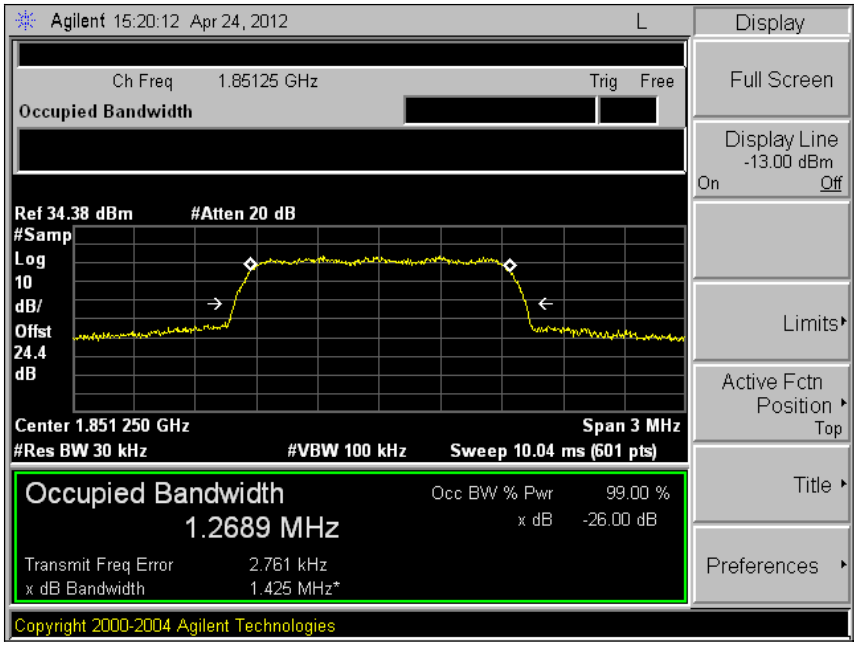
High Channel



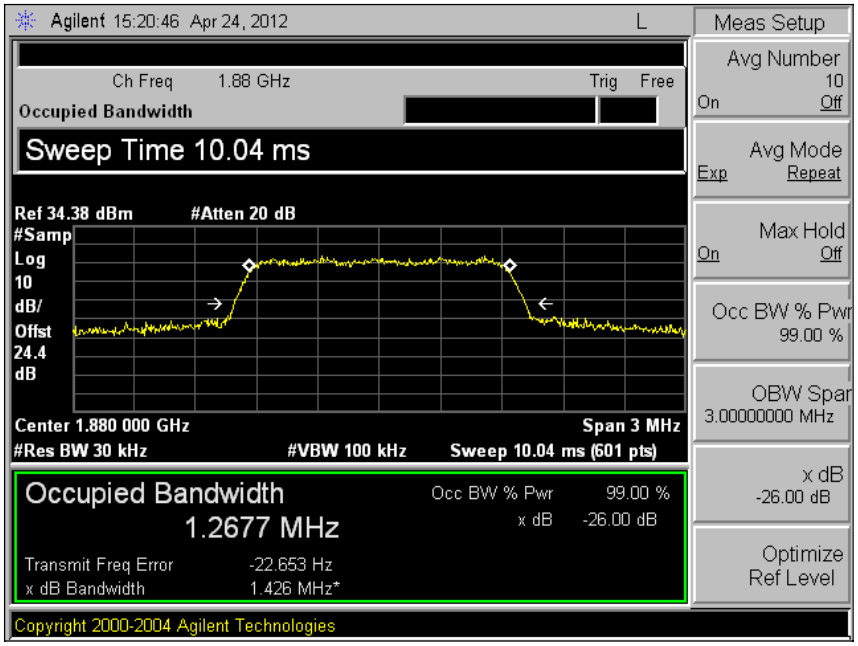
**CDMA1900**

**EV DO Revision A**

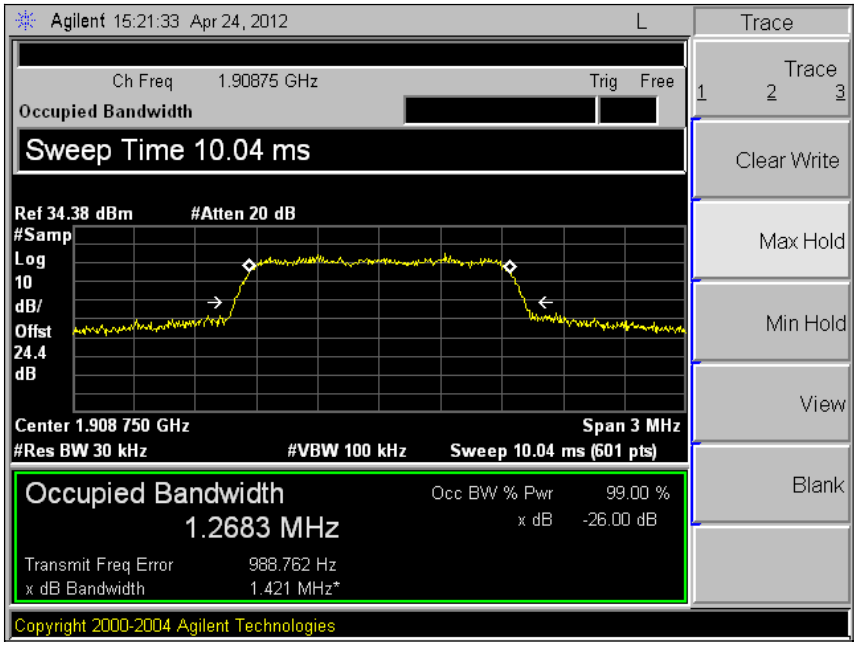
Low Channel




Middle Channel



High Channel



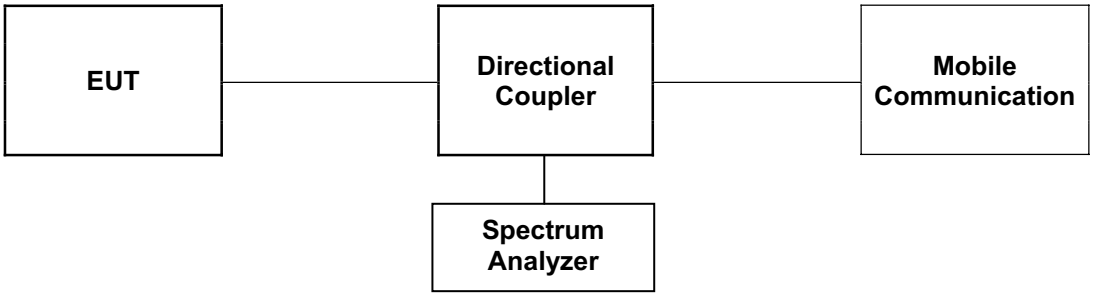
# 5. Spurious Emissions at Antenna Terminal

## 5.1. Limit

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

## 5.2. Test Procedure

1. The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.
2. The resolution bandwidth of the spectrum analyzer was set at 1 ㎒. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.



## 5.3. Test Results

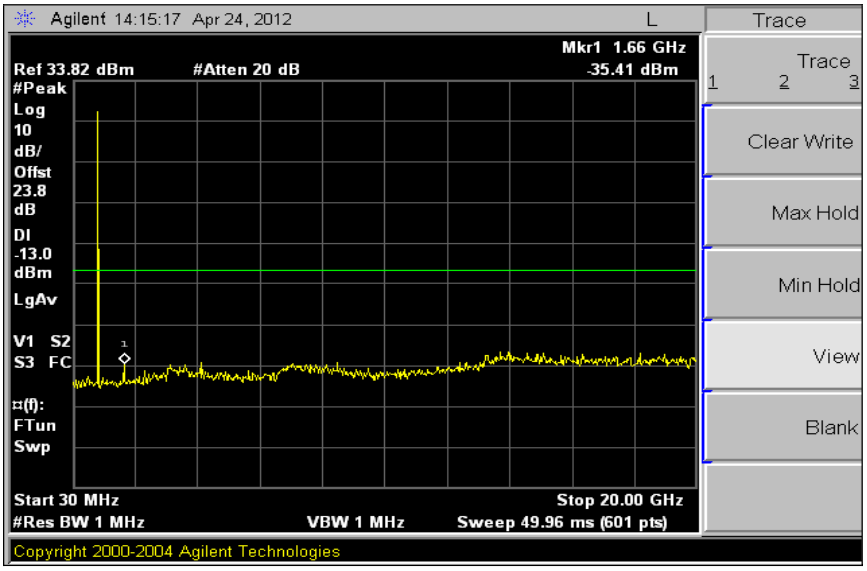
| | | |
|---|---|---|
| Ambient temperature | : | (24 ± 2) ℃ |
| Relative humidity | : | 47 % R.H. |

Please refer to the following plots.

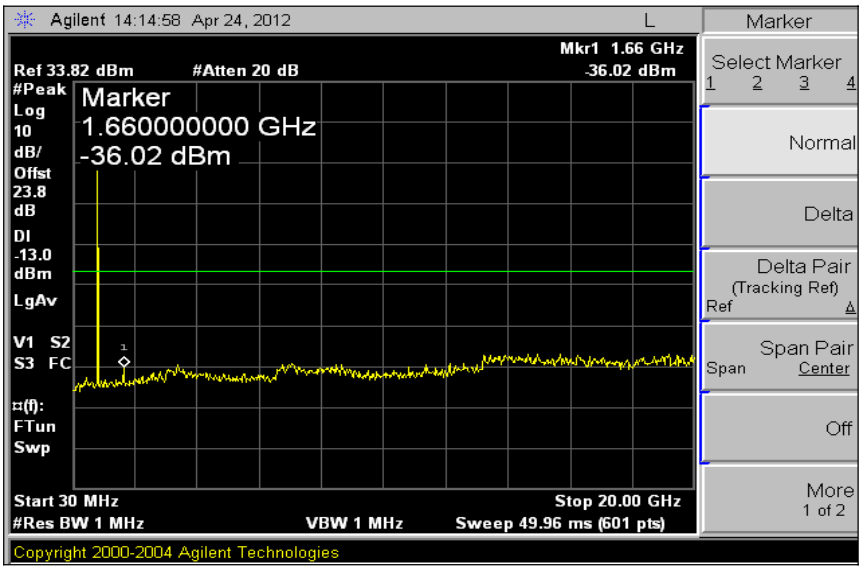
**CDMA800**

**1xRTT**

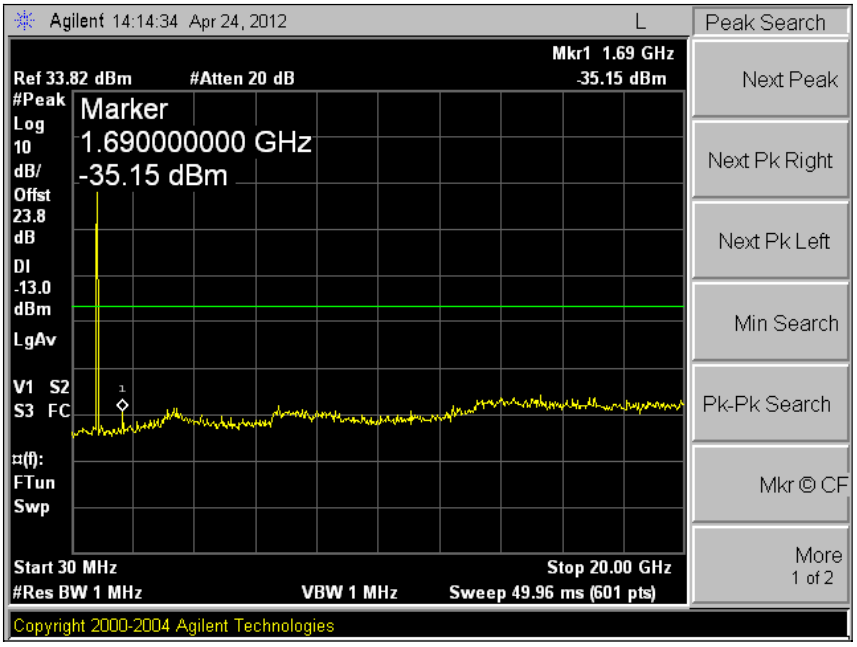
Low Channel




Middle Channel



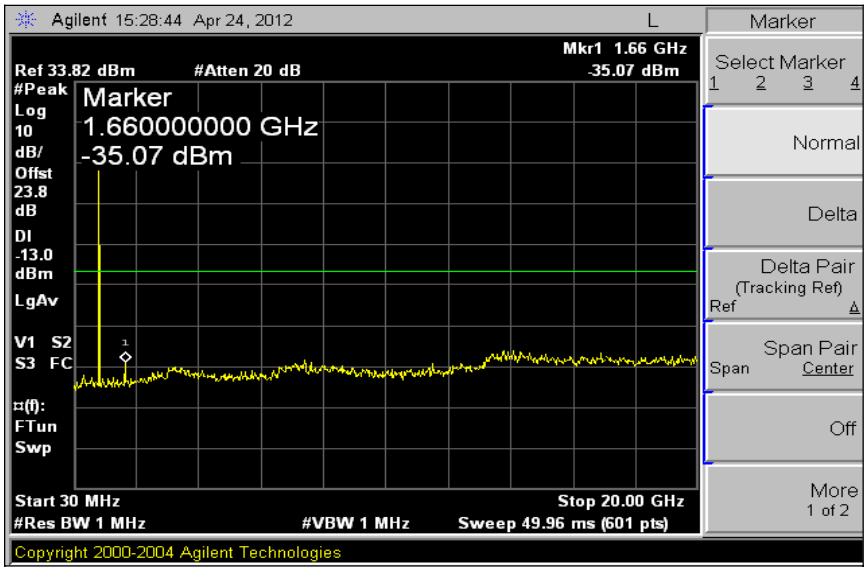
High Channel



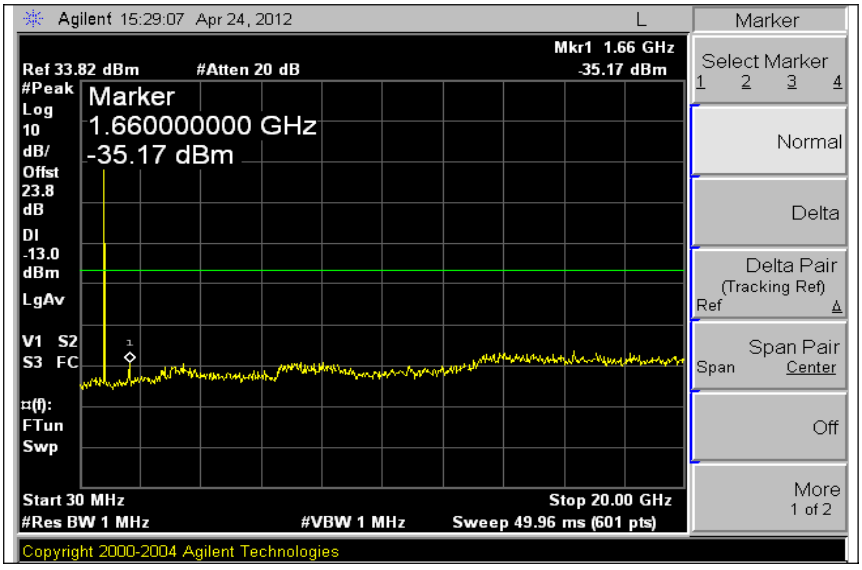
**CDMA800**

**EV DO Revision A**

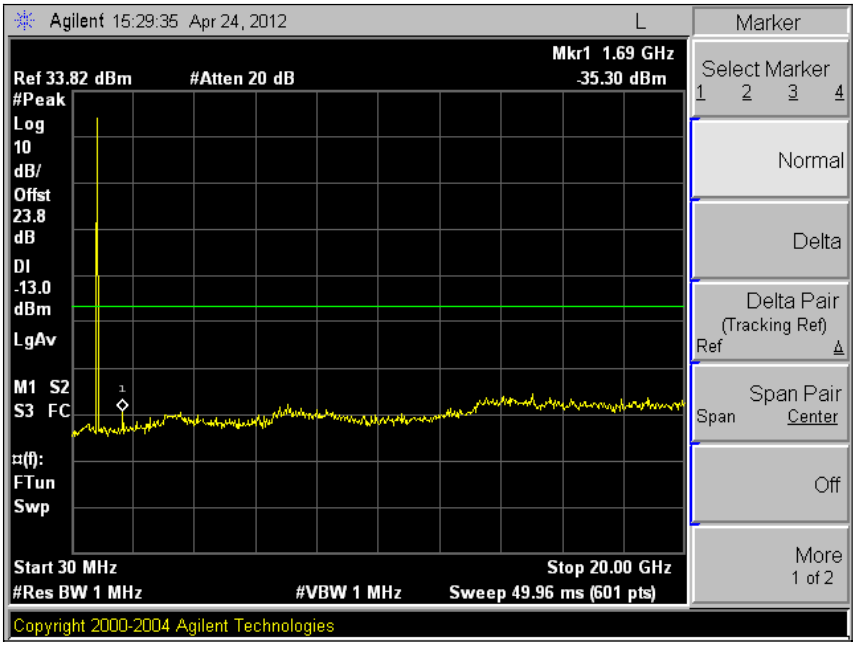
Low Channel




Middle Channel



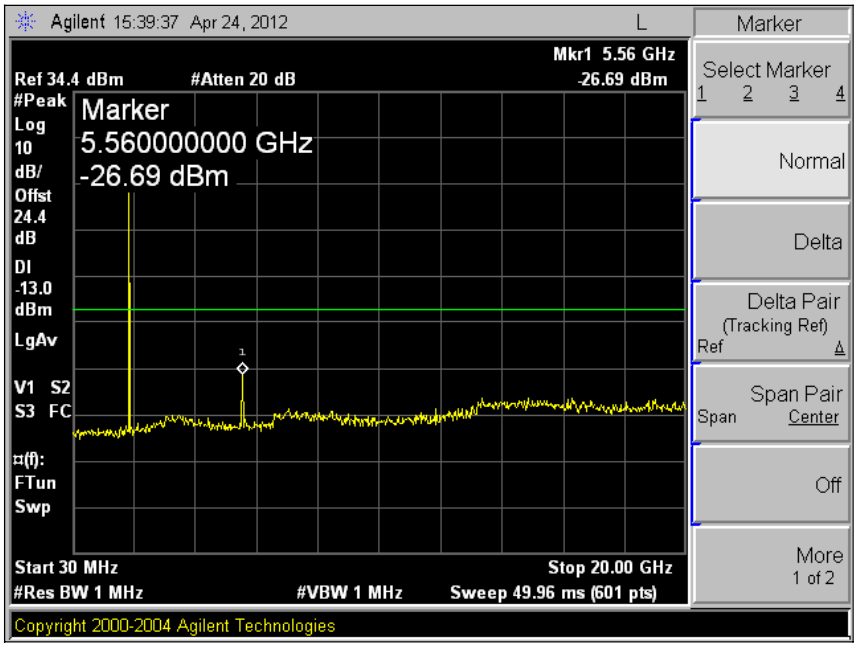
High Channel



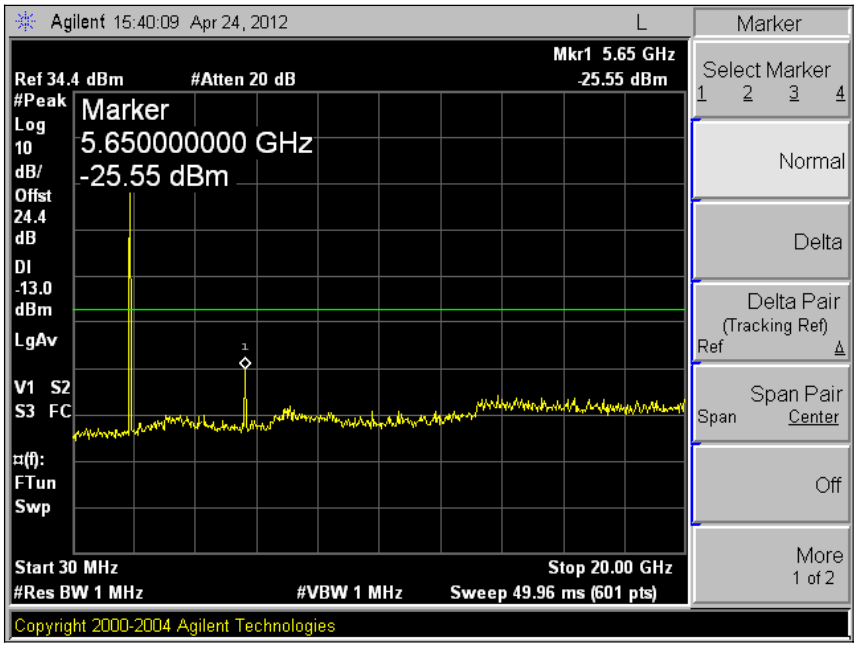
**CDMA1900**

**1xRTT**

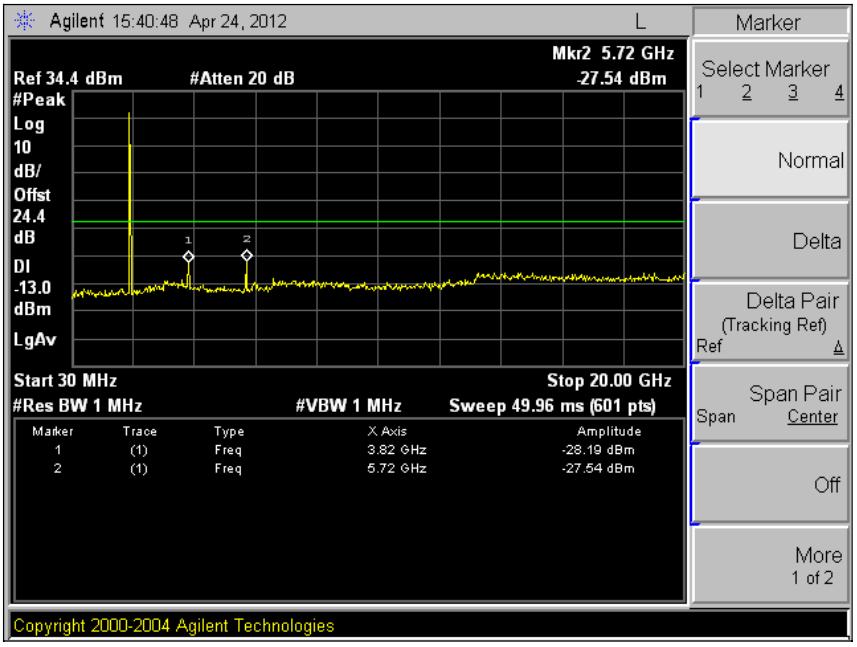
Low Channel




Middle Channel



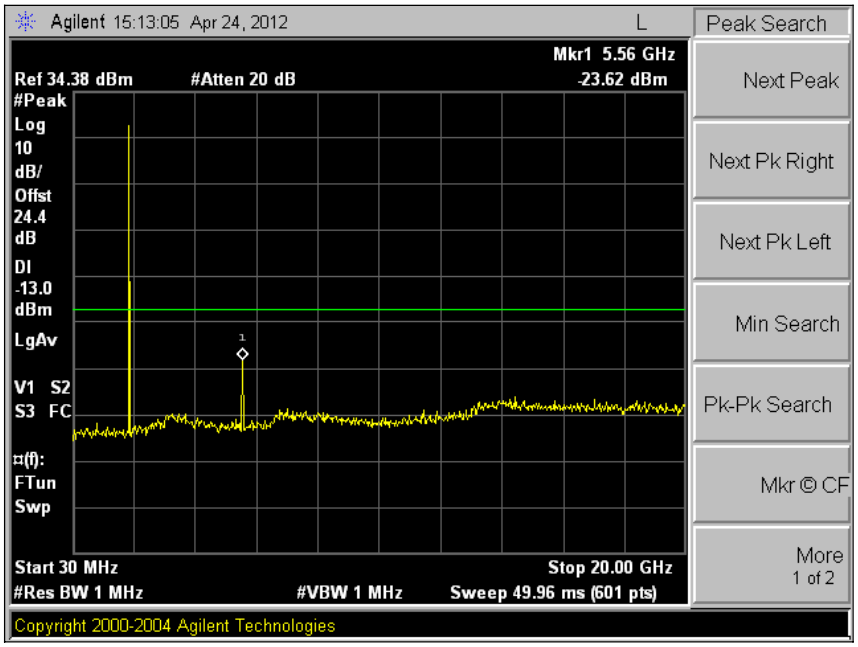
High Channel



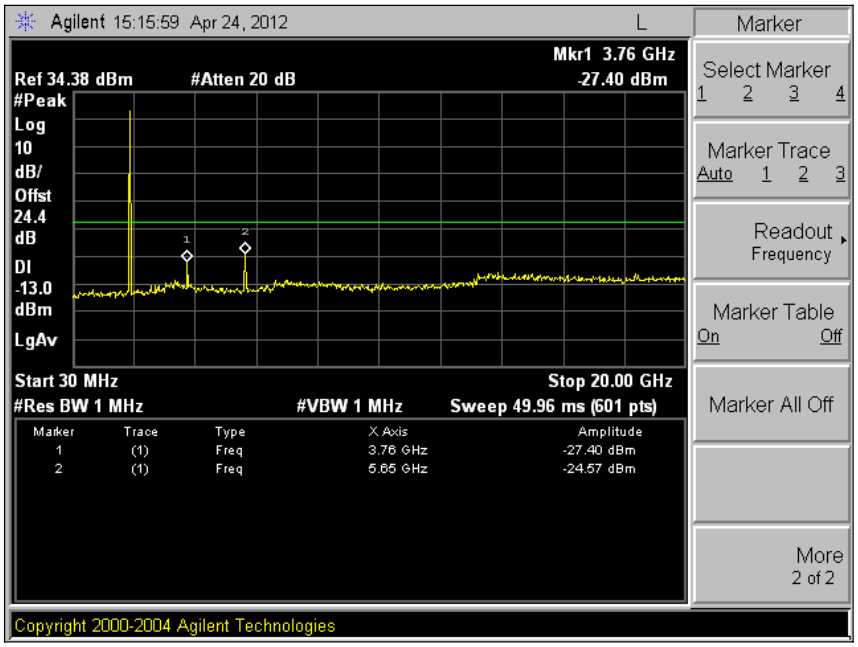
**CDMA1900**

**EV DO Revision A**

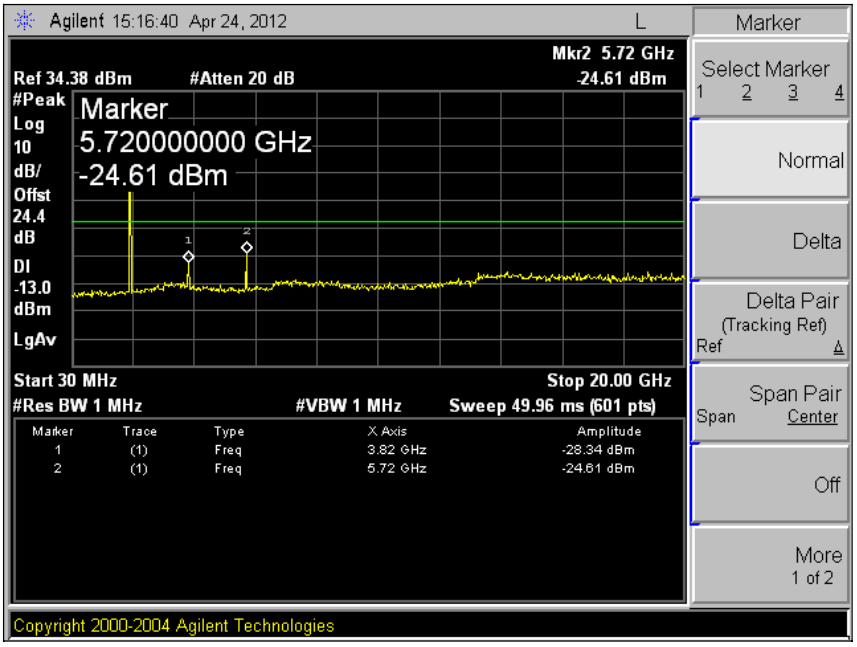
Low Channel




Middle Channel



High Channel



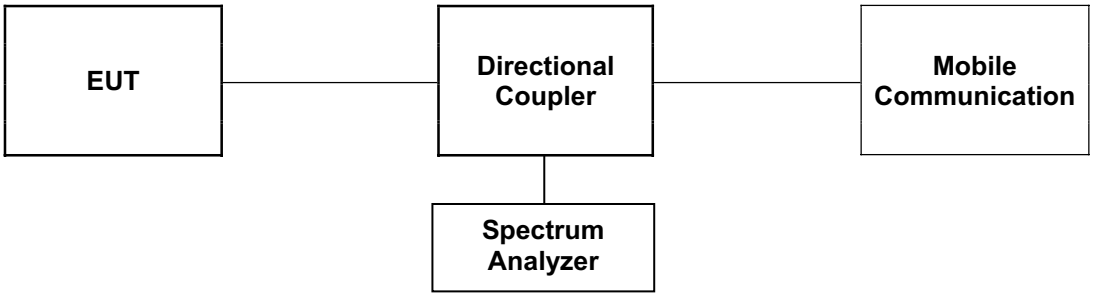
# 6. Band Edge

## 6.1. Limit

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

## 6.2. Test Procedure

1. The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.
2. The center of the spectrum analyzer was set to block edge frequency.



## 6.3. Test Results

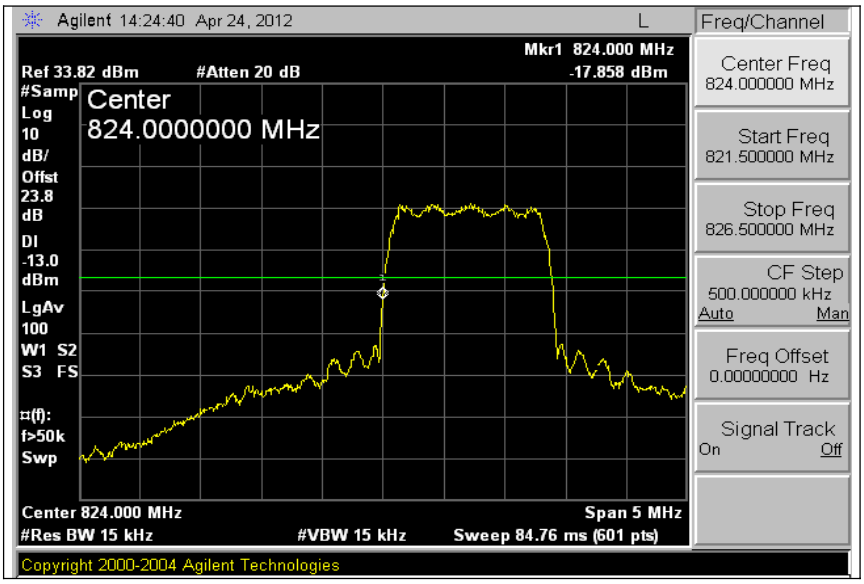
| | | |
|---|---|---|
| Ambient temperature | : | (24 ± 2) ℃ |
| Relative humidity | : | 47 % R.H. |

Please refer to the following plots.

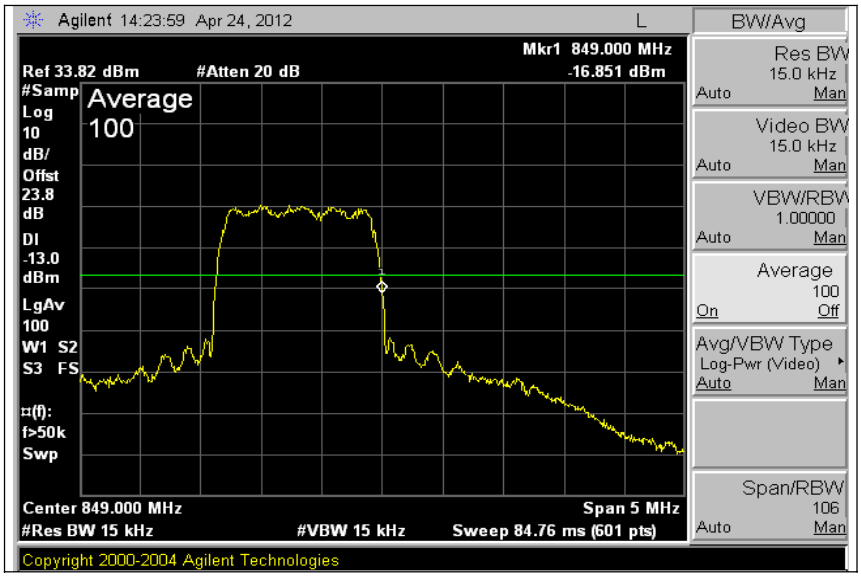
**CDMA800**

**1xRTT**

Low Channel



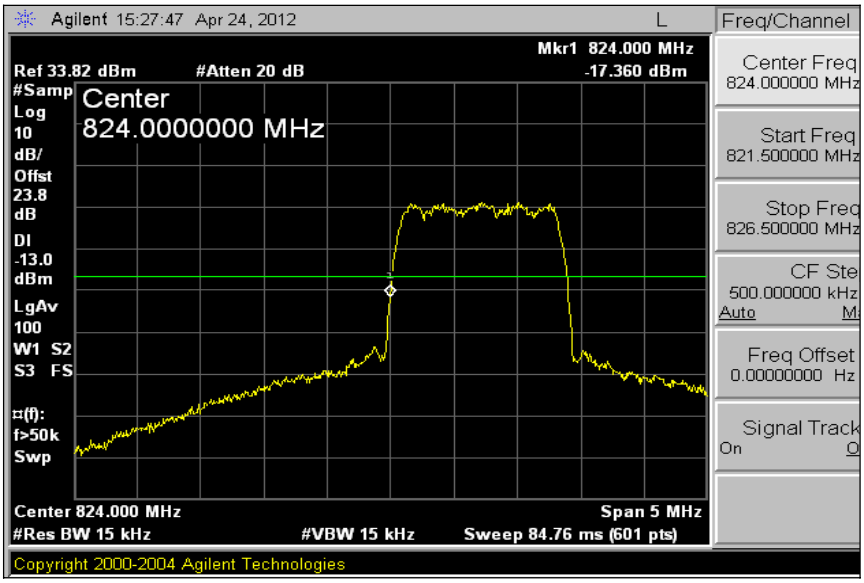

High Channel



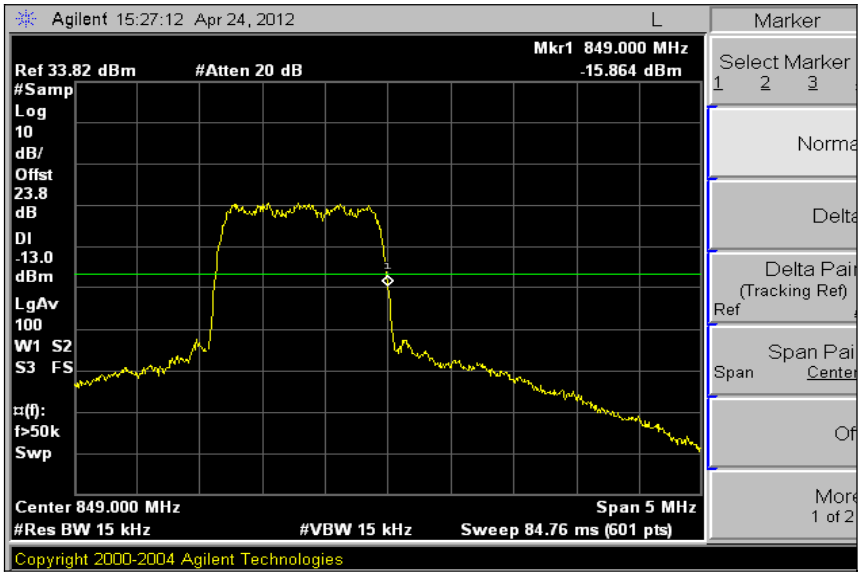
**CDMA800**

**EV DO Revision A**

Low Channel




High Channel

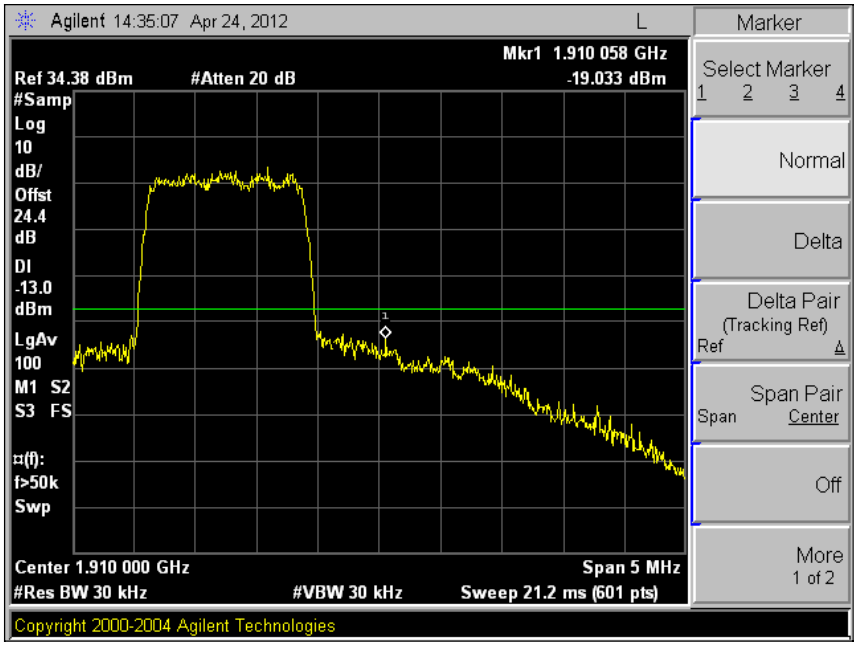


**CDMA1900**

**1xRTT**

Low Channel

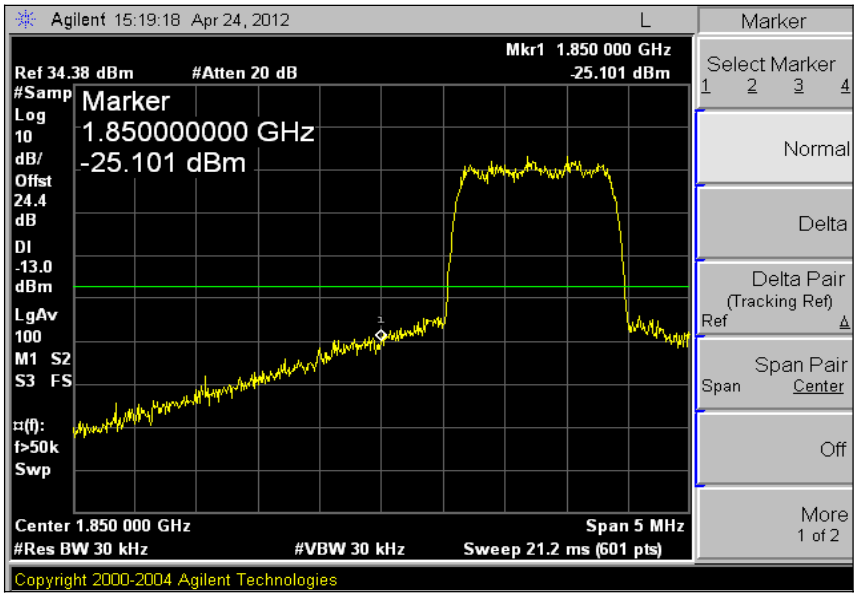

High Channel



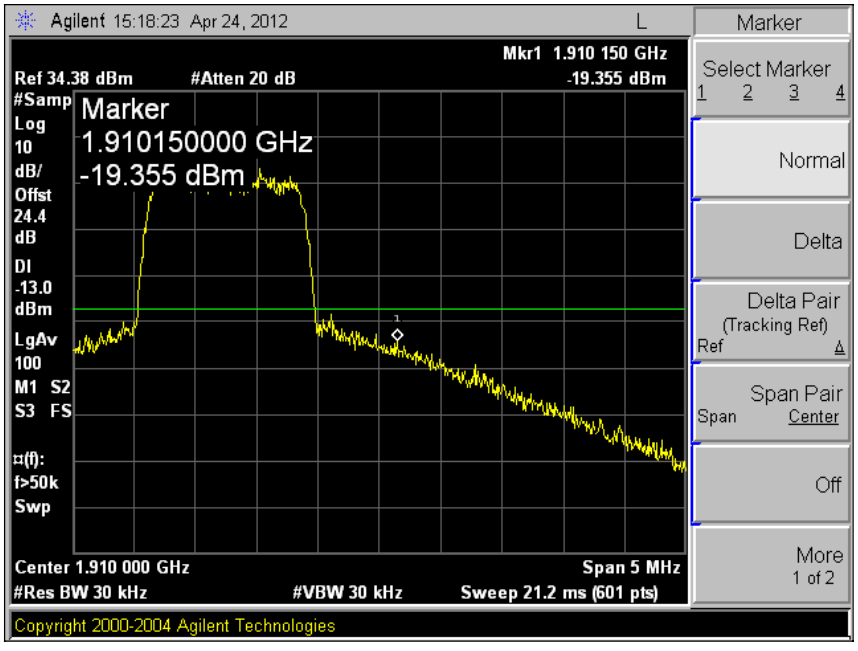
**CDMA1900**

**EV DO Revision A**

Low Channel




High Channel



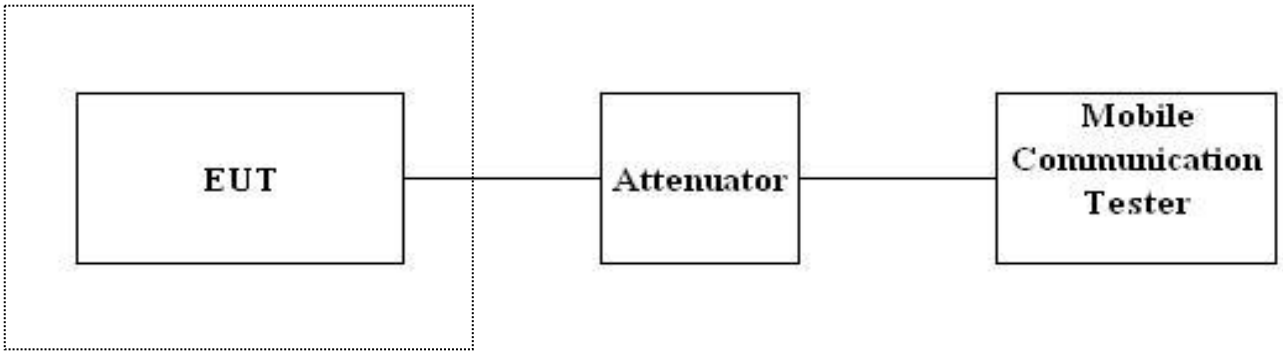
# 7. Frequency Stability

## 7.1. Limit

Requirements: FCC § 2.1055 (a), § 2.1055 (d) & following:
According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table of this section.
For Mobile devices operating in the 824 to 849 ㎒ band at a power level less than or equal to 3 Watts, the limit specified in Table C-1 is +/- 2.5 ppm.
§24.235 The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

## 7.2. Test Procedure

1. Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed-through attenuators.
2. The EUT was placed inside the temperature chamber.
3. After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.




Temperature Chamber

## 7.3. Test Results

Ambient temperature : (24 ± 2) ℃
Relative humidity : 47 % R.H.

**CDMA800 1xRTT mode at middle channel**

| Reference Frequency: 836.52 ㎒, Limit: 2.5 ppm | | | |
|---|---|---|---|
| **Frequency Stability versus Temperature** | | | |
| **Environment Temperature (℃)** | **Power Supplied (Vdc)** | **Frequency Measure with Time Elapse** | |
| | | **Frequency Error (㎐)** | **ppm** |
| 50 | 12.0 | 10 | 0.012 0 |
| 40 | | -10 | -0.012 0 |
| 30 | | -3 | -0.003 6 |
| 24 | | 2 | 0.002 4 |
| 10 | | -3 | -0.003 6 |
| 0 | | -4 | -0.004 8 |
| -10 | | -3 | -0.003 6 |
| -20 | | -4 | -0.004 8 |
| -30 | | 5 | 0.006 0 |
| **Frequency Stability versus power Supply** | | | |
| **Environment Temperature (℃)** | **Power Supplied (Vdc)** | **Frequency Measure with Time Elapse** | |
| | | **Frequency Error (Hz)** | **ppm** |
| 24 | 13.8 (+15 %) | 3 | 0.003 6 |
| | 10.2 (-15 %) | 1 | 0.001 2 |

**CDMA800 EV DO Revision A mode at middle channel**

| Reference Frequency: 836.52 ㎒, Limit: 2.5 ppm | | | |
|---|---|---|---|
| **Frequency Stability versus Temperature** | | | |
| **Environment Temperature (℃)** | **Power Supplied (Vdc)** | **Frequency Measure with Time Elapse** | |
| | | **Frequency Error (㎐)** | **ppm** |
| 50 | 12.0 | 7 | 0.008 4 |
| 40 | | 3 | 0.003 6 |
| 30 | | 7 | 0.008 4 |
| 24 | | 7 | 0.008 4 |
| 10 | | 6 | 0.007 2 |
| 0 | | 6 | 0.007 2 |
| -10 | | -5 | -0.006 0 |
| -20 | | -6 | -0.007 2 |
| -30 | | 4 | 0.004 8 |
| **Frequency Stability versus power Supply** | | | |
| **Environment Temperature (℃)** | **Power Supplied (Vdc)** | **Frequency Measure with Time Elapse** | |
| | | **Frequency Error (Hz)** | **ppm** |
| 24 | 13.8 (+15 %) | 6 | 0.007 2 |
| | 10.2 (-15 %) | 5 | 0.006 0 |

**CDMA1900 1xRTT mode at middle channel**

| Reference Frequency: 1 880.0 ㎒, Limit: 2.5 ppm | | | |
|---|---|---|---|
| **Frequency Stability versus Temperature** | | | |
| **Environment Temperature (℃)** | **Power Supplied (Vdc)** | **Frequency Measure with Time Elapse** | |
| | | **Frequency Error (㎐)** | **ppm** |
| 50 | 12.0 | -9 | -0.004 8 |
| 40 | | -19 | -0.010 1 |
| 30 | | -19 | -0.010 1 |
| 24 | | -13 | -0.006 9 |
| 10 | | 7 | 0.003 7 |
| 0 | | 8 | 0.004 3 |
| -10 | | 5 | 0.002 7 |
| -20 | | -4 | -0.002 1 |
| -30 | | -4 | -0.002 1 |
| **Frequency Stability versus power Supply** | | | |
| **Environment Temperature (℃)** | **Power Supplied (Vdc)** | **Frequency Measure with Time Elapse** | |
| | | **Frequency Error (Hz)** | **ppm** |
| 24 | 13.8 (+15 %) | -11 | -0.005 9 |
| | 10.2 (-15 %) | -13 | -0.006 9 |

**CDMA1900 EV DO Revision A mode at middle channel**

| Reference Frequency: 1 880.0 ㎒, Limit: 2.5 ppm | | | |
|---|---|---|---|
| **Frequency Stability versus Temperature** | | | |
| **Environment Temperature (℃)** | **Power Supplied (Vdc)** | **Frequency Measure with Time Elapse** | |
| | | **Frequency Error (㎐)** | **ppm** |
| 50 | 12.0 | 13 | 0.006 9 |
| 40 | | 12 | 0.006 4 |
| 30 | | 13 | 0.006 9 |
| 24 | | 13 | 0.006 9 |
| 10 | | 12 | 0.006 4 |
| 0 | | 13 | 0.006 9 |
| -10 | | 12 | 0.006 4 |
| -20 | | 10 | 0.005 3 |
| -30 | | 6 | 0.003 2 |
| **Frequency Stability versus power Supply** | | | |
| **Environment Temperature (℃)** | **Power Supplied (Vdc)** | **Frequency Measure with Time Elapse** | |
| | | **Frequency Error (Hz)** | **ppm** |
| 24 | 13.8 (+15 %) | 12 | 0.006 4 |
| | 10.2 (-15 %) | 13 | 0.006 9 |

# 8. RF Exposure Evaluation

## 8.1 Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

According to FCC 1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in §1.1307(b)

**LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

| Frequency Range (㎒) | Electric Field Strength(V/m) | Magnetic Field Strength (A/m) | Power Density (㎽/㎠) | Average Time |
|---|---|---|---|---|
| (A) Limits for Occupational /Control Exposures | | | | |
| 300 – 1 500 | -- | -- | F/300 | 6 |
| 1 500 – 100 000 | -- | -- | 5 | 6 |
| (B) Limits for General Population/Uncontrol Exposures | | | | |
| **300 – 1 500** | **--** | **--** | **F/1500** | **30** |
| **1 500 – 100 000** | **--** | **--** | **1** | **30** |

### 8.1.1. Friis transmission formula: Pd = (Pout*G)/(4*pi*$R^2$)

Where Pd = power density in ㎽/㎠

Pout = output power to antenna in ㎽

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in ㎝

Pd the limit of MPE, 1 ㎽/㎠. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

## 8.1.2. Test Result of RF Exposure Evaluation

Test Item : RF Exposure Evaluation Data
Test Mode : Normal Operation

## 8.1.3. Output Power into Antenna & RF Exposure Evaluation Distance

**Mode: CDMA800 1xRTT**

| Channel | Channel Frequency (㎒) | Measured E.R.P. (dB m) | Duty Cycle (%) | Power Density at 20 ㎝ (㎽/㎠) | LIMITS (㎽/㎠) |
|---|---|---|---|---|---|
| Low | 824.70 | 27.99 | 100 | 0.125 236 | 0.549 80 |
| Middle | 836.52 | 25.46 | 100 | 0.069 941 | 0.557 68 |
| High | 848.31 | 27.89 | 100 | 0.122 385 | 0.565 54 |

Note :
1. The power density Pd (5th column) at a distance of 20 ㎝ calculated from the friis transmission formula is far below the limit .

**Mode: CDMA800 EV DO Revision A**

| Channel | Channel Frequency (㎒) | Measured E.R.P. (dB m) | Duty Cycle (%) | Power Density at 20 ㎝ (㎽/㎠) | LIMITS (㎽/㎠) |
|---|---|---|---|---|---|
| Low | 824.70 | 28.05 | 100 | 0.126 978 | 0.549 80 |
| Middle | 836.52 | 26.22 | 100 | 0.083 316 | 0.557 68 |
| High | 848.31 | 28.46 | 100 | 0.139 550 | 0.565 54 |

Note :
1. The power density Pd (5th column) at a distance of 20 ㎝ calculated from the friis transmission formula is far below the limit .

**Mode: CDMA1900 1xRTT**

| Channel | Channel Frequency (㎒) | Measured E.I.R.P. (dB m) | Duty Cycle (%) | Power Density at 20 ㎝ (㎽/㎠) | LIMITS (㎽/㎠) |
|---|---|---|---|---|---|
| Low | 1 851.25 | 29.83 | 100 | 0.191 306 | 1 |
| Middle | 1 880.00 | 28.28 | 100 | 0.133 884 | 1 |
| High | 1 908.75 | 28.52 | 100 | 0.141 491 | 1 |

Note :
1. The power density Pd (5th column) at a distance of 20 ㎝ calculated from the friis transmission formula is far below the limit .

**Mode: CDMA1900 EV DO Revision A**

| Channel | Channel Frequency (㎒) | Measured E.I.R.P. (dB m) | Duty Cycle (%) | Power Density at 20 ㎝ (㎽/㎠) | LIMITS (㎽/㎠) |
|---|---|---|---|---|---|
| Low | 1 851.25 | 30.61 | 100 | 0.228 944 | 1 |
| Middle | 1 880.00 | 28.88 | 100 | 0.153 720 | 1 |
| High | 1 908.75 | 29.35 | 100 | 0.171 289 | 1 |

Note :
1. The power density Pd (5th column) at a distance of 20 ㎝ calculated from the friis transmission formula is far below the limit .