



**FCC CFR47 PART 27 SUBPART L  
&  
INDUSTRY CANADA RSS-139  
CERTIFICATION TEST REPORT  
FOR**

**802.11BG, BT, WWAN COMBO MODULE**

**MODEL NUMBER: FENWAY**

**FCC ID: J9CFENWAY-1**

**IC: 2723A-FENWAY1**

**REPORT NUMBER: 08U12127-4**

**ISSUE DATE: DECEMBER 16, 2008**

*Prepared for*

**QUALCOMM  
5775 MOREHOUSE DRIVE  
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**NVLAP LAB CODE 200065-0**

Revision History

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** QUALCOMM CORPORATE  
5775 MOREHOUSE DRIVE  
SAN DIEGO, CA. 92121, UNITED STATES.

**EUT DESCRIPTION:** 802.11bg, BT, WWAN Combo Module

**MODEL:** FENWAY

**SERIAL NUMBER:** HCR1JJW

**DATE TESTED:** NOVEMBER 06-15, 2008

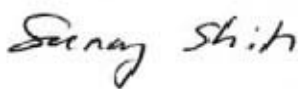
| APPLICABLE STANDARDS  |              |
|-----------------------|--------------|
| STANDARD              | TEST RESULTS |
| FCC PART 27 SUBPART L | Pass         |
| IC RSS-139 ISSUE 1    | Pass         |

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All expressions of Pass/Fail in this report are opinions expressed by CCS based on interpretations of the test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:



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SUNNY SHIH  
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## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with RSS-GEN, RSS-139 Issue 1 and FCC CFR 47 Part 2, and FCC CFR 47 Part 27.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://ts.nist.gov/Standards/scopes/2000650.htm>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER                           | UNCERTAINTY    |
|-------------------------------------|----------------|
| Radiated Emission, 30 to 200 MHz    | +/- 3.3 dB     |
| Radiated Emission, 200 to 1000 MHz  | +4.5 / -2.9 dB |
| Radiated Emission, 1000 to 2000 MHz | +4.5 / -2.9 dB |
| Power Line Conducted Emission       | +/- 2.9 dB     |

Uncertainty figures are valid to a confidence level of 95%.

## **5. EQUIPMENT UNDER TEST**

### **5.1. DESCRIPTION OF EUT**

The EUT is an 802.11bg, BT, WWAN Combo Module.

Fenway is a ruggedized Win Mobile PDA device for the Vertical and Enterprise markets. Fenway will deliver WWAN connectivity solutions for the UMTS HSDPA and HSUPA, and GSM/GPRS/EDGE protocols in one hardware configuration.

In the US and Canada, only 850 MHz (Cellular), 1700 MHz (AWS) and 1900 MHz (PCS) bands are used for WCDMA and GSM operation. The EUT was only tested in those three bands for FCC application.

### **5.2. DESCRIPTION OF AVAILABLE ANTENNAS**

The radio utilizes a Magnetic Mount triple-frequency Mobile antenna with a maximum gain of 0 dBi.

### 5.3. DESCRIPTION OF TEST SETUP

#### SUPPORT EQUIPMENT

| PERIPHERAL SUPPORT EQUIPMENT LIST |              |              |               |        |
|-----------------------------------|--------------|--------------|---------------|--------|
| Description                       | Manufacturer | Model        | Serial Number | FCC ID |
| Laptop                            | HP           | Compaq6910p  | CND8153FTV    | DoC    |
| AC Adapter                        | HP           | PA-1131-08HC | 7500329102    | DoC    |
| DC Power Supply                   | XANTREX      | XHR60-18     | 1064          | NA     |
| Horn                              | EMCO         | 3115         | 6717          | NA     |
| AC Adapter                        | QUALCOMM     | GWC-1700     | CV90-C6024    | DoC    |
| Qualcomm Miniposer                | QUALCOMM     | NA           | NA            | NA     |

#### I/O CABLES ( CONDUCTED TEST)

| I/O CABLE LIST |           |                      |                |             |              |         |
|----------------|-----------|----------------------|----------------|-------------|--------------|---------|
| Cable No.      | Port      | # of Identical Ports | Connector Type | Cable Type  | Cable Length | Remarks |
| 1              | AC        | 3                    | US 115V        | Un-shielded | 2m           | No      |
| 2              | DC        | 3                    | DC             | Un-shielded | 2m           | No      |
| 3              | USB       | 1                    | USB            | Un-shielded | 2m           | Yes     |
| 4              | RF In/Out | 1                    | SMA            | Un-shielded | 1m           | Yes     |

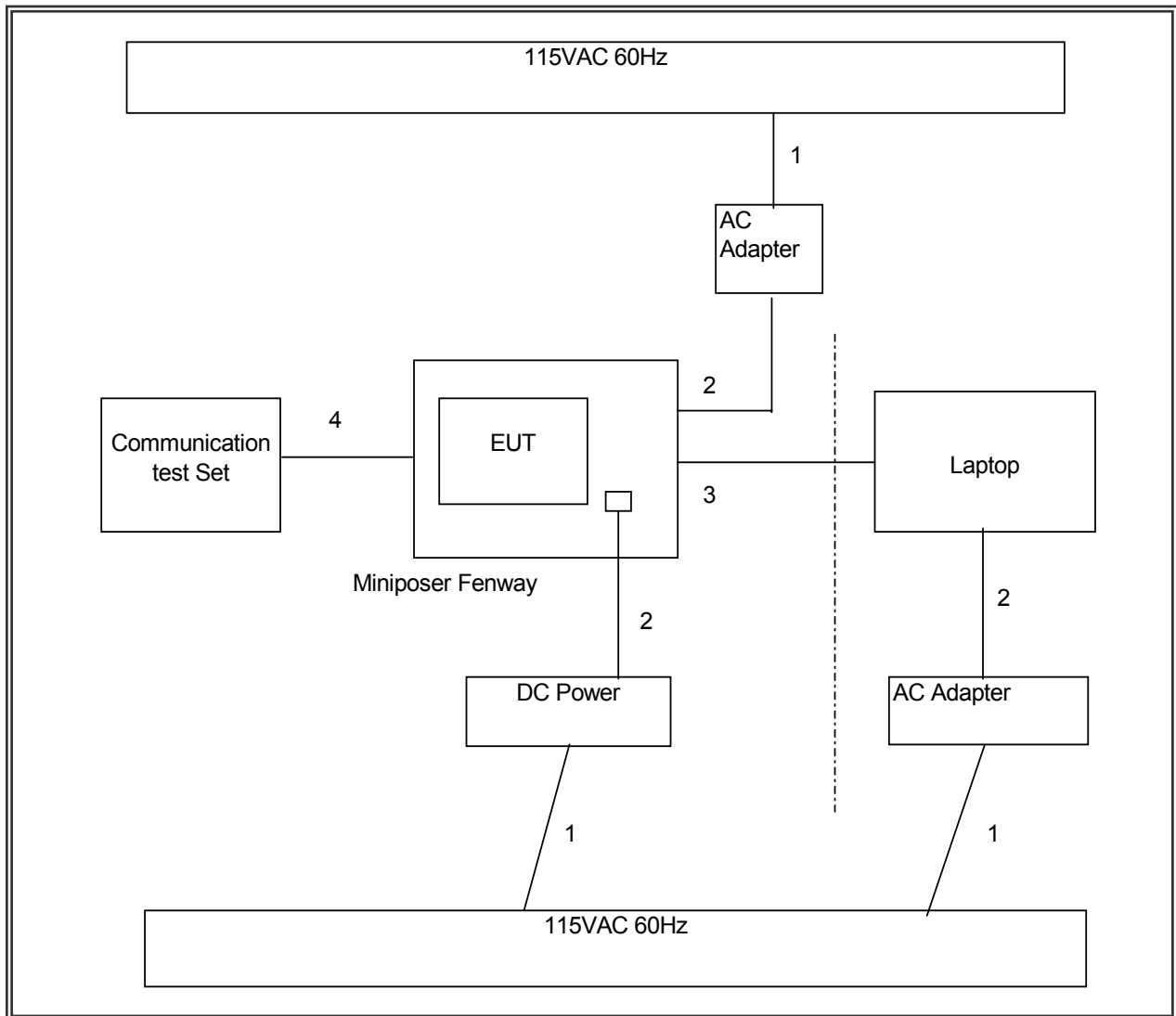
#### I/O CABLES (RADIATED TEST)

| I/O CABLE LIST |           |                      |                |             |              |         |
|----------------|-----------|----------------------|----------------|-------------|--------------|---------|
| Cable No.      | Port      | # of Identical Ports | Connector Type | Cable Type  | Cable Length | Remarks |
| 1              | AC        | 3                    | US 115V        | Un-shielded | 2m           | No      |
| 2              | DC        | 3                    | DC             | Un-shielded | 2m           | No      |
| 3              | USB       | 1                    | USB            | Un-shielded | 2m           | Yes     |
| 4              | RF In/Out | 1                    | Horn           | Un-shielded | 1m           | Yes     |

#### TEST SETUP

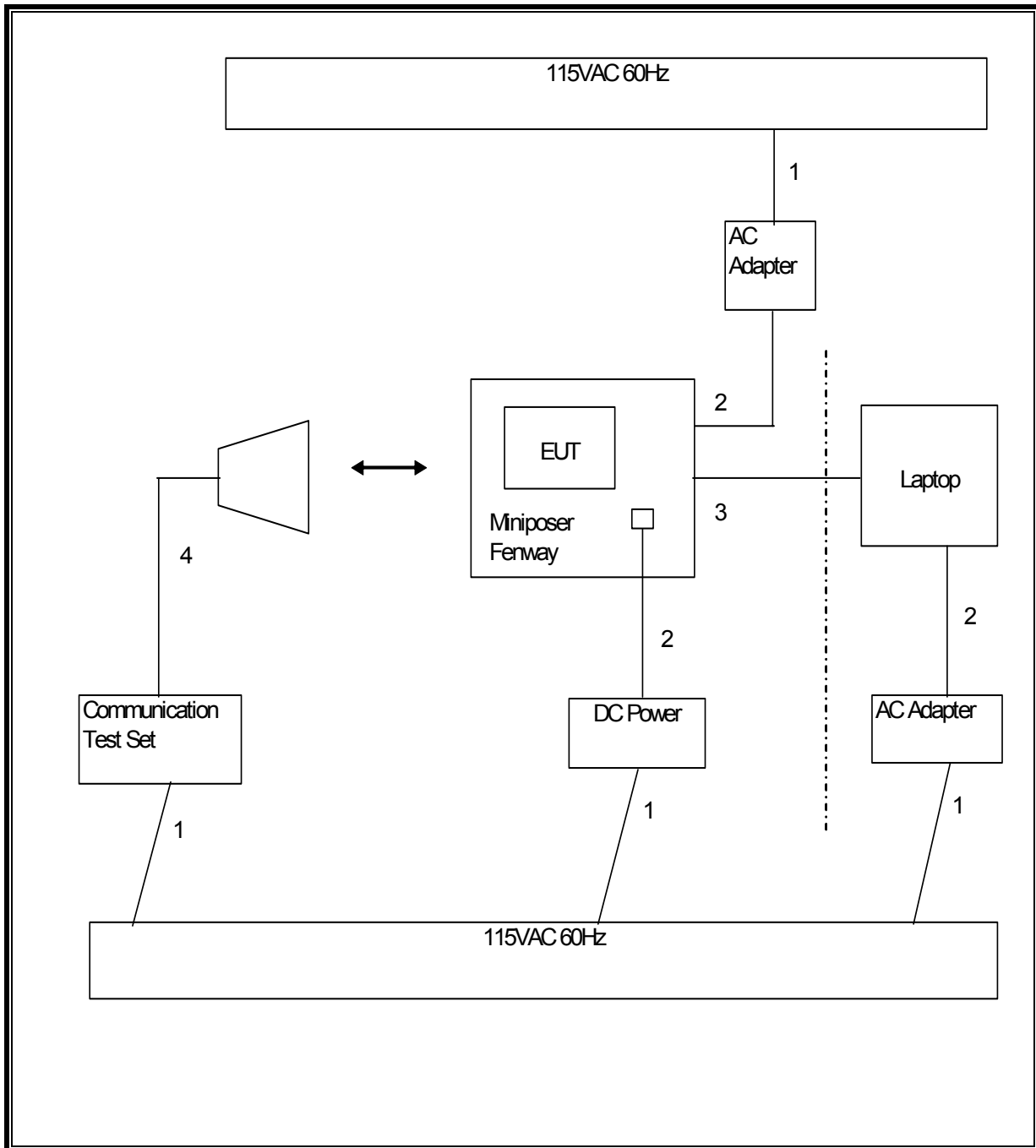
The EUT is installed in a test fixture during the tests. A link is established between the EUT and the Agilent 8960 communications test set.

**SETUP DIAGRAM FOR CONDUCTED TESTS**





**SETUP DIAGRAM FOR RADIATED TESTS**



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

| TEST EQUIPMENT LIST        |                |                  |        |          |          |
|----------------------------|----------------|------------------|--------|----------|----------|
| Description                | Manufacturer   | Model            | Asset  | Cal Date | Cal Due  |
| Spectrum Analyzer, 44 GHz  | Agilent / HP   | E4446A           | C01012 | 12/03/07 | 03/03/09 |
| Temperature / Humidity     | Thermotron     | SE 600-10-10     | C00930 | 05/13/08 | 05/13/09 |
| Antenna, Horn, 18 GHz      | ETS            | 3117             | C01006 | 04/22/08 | 04/22/09 |
| Preamplifier, 26.5 GHz     | Agilent / HP   | 8449B            | C01063 | 09/27/07 | 08/05/09 |
| EMI Receiver, 2.9 GHz      | Agilent / HP   | 8542E            | C00957 | 06/19/08 | 09/19/09 |
| RF Filter Section, 2.9 GHz | Agilent / HP   | 85420E           | C00958 | 06/19/08 | 09/19/09 |
| EMI Test Receiver, 30 MHz  | R & S          | ESHS 20          | N02396 | 02/06/08 | 08/06/09 |
| Communications Test Set    | Agilent / HP   | E5515C           | C01086 | 06/16/08 | 06/16/09 |
| Antenna, Bilog, 2 GHz      | Sunol Sciences | JB1              | C01011 | 02/11/08 | 02/11/09 |
| Preamplifier, 1300 MHz     | Agilent / HP   | 8447D            | C01064 | 05/09/07 | 03/31/09 |
| LISN, 30 MHz               | FCC            | LISN-50/250-25-2 | N02625 | 09/15/06 | 10/29/09 |

## 7. TEST SUMMARY

| Description of test                      | Rule part              |                         | Results  |
|--|------------------------|-------------------------|----------|
|  | FCC                    | IC                      |          |
| 1. RF Power Output                       | §2.1046,               | RSS-139                 | Complies |
| 2. Occupied Bandwidth                    | §2.1049                | RSS-Gen, 4.6            | --       |
| 3. Block Edge (Band Edge)                | §27.53                 | RSS-139, 6.5            | Complies |
| 4. Out of Band Emissions                 | §2.1051, §27.53        | RSS-139, 6.5            | Complies |
| 5. Frequency Stability                   | §2.1055, §27.54        | RSS-139, 6.3            | Complies |
| 6. Radiated Power (ERP & EIRP)           | §2.1046, §27.50(d) (2) | RSS-139, 6.4            | Complies |
| 7. Field Strength of Spurious Radiation  | §2.1053, §24.53        | RSS-139, 6.5            | Complies |
| 8. Receiver Spurious Emissions (IC only) | n/a                    | RSS-139, 6.6<br>RSS-Gen | Complies |

## 8. MAXIMUM OUTPUT POWER

The transmitter has a maximum output power as follows:

Part 27 UMTS Band IV

| Frequency range (MHz) | Modulation    | Conducted |       | EIRP |       |
|-----------------------|---------------|-----------|-------|------|-------|
|                       |               | dBm       | mW    | dBm  | mW    |
| 1710 – 1755           | UMTS - Rel 99 | 28.8      | 756.8 | 27.5 | 562.3 |
|                       | UMTS - HSDPA  | 29.2      | 822.2 | 27.8 | 602.6 |

## **9. RF POWER OUTPUT VERIFICATION**

### **RULE PART(S)**

FCC: §2.1046  
IC: RSS-139, 6.4

### **LIMITS**

For reporting purposes only

### **TEST PROCEDURE**

The transmitter output was connected to an Agilent 8960 Test Set and configured to operate at maximum power in a call. The peak power was measured using the spectrum analyzer at three equally spaced operating frequencies for each band. The RBW was set to 300 KHz for the GSM and EDGE measurements and 5 MHz for the UMTS (WCDMA) measurements.

### **MODES TESTED**

- UMTS (W-CDMA) - Rel 99, Rel 6 HSDPA and HSPA (HSDPA & HSUPA)

### **RESULTS**

See Section 9.1 to 9.3

### 9.1. RF POWER OUTPUT FOR UMTS REL99

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 V7.5.0 specification. The EUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7) 12.2kps RMC is used for this testing. Power control set to All bits up. A summary of these settings are illustrated below:

|                        |                         |                |
|------------------------|-------------------------|----------------|
|                        | Mode                    | Rel99          |
|                        | Subtest                 | -              |
| WCDMA General Settings | Loopback Mode           | Test Mode 1    |
|                        | Rel99 RMC               | 12.2kpbs RMC   |
|                        | HSDPA FRC               | Not Applicable |
|                        | HSUPA Test              | Not Applicable |
|                        | Power Control Algorithm | Algorithm2     |
|                        | $\beta_c$               | Not Applicable |
|                        | $\beta_d$               | Not Applicable |
|                        | $\beta_{ec}$            | Not Applicable |
|                        | $\beta_c/\beta_d$       | 8/15           |
|                        | $\beta_{hs}$            | Not Applicable |
|                        | $\beta_{ed}$            | Not Applicable |

#### REL 99

| Band                  | UL Ch | DL Ch | Frequency | Conducted output power (dBm) |       |
|-----------------------|-------|-------|-----------|------------------------------|-------|
|                       |       |       |           | Average                      | Peak  |
| UNTS1710<br>(Band IV) | 1312  | 1537  | 1712.4    | 24.50                        | 28.81 |
|                       | 1412  | 1637  | 1732.4    | 24.20                        | 28.61 |
|                       | 1513  | 1738  | 1754.0    | 24.50                        | 28.82 |

## 9.2. RF POWER OUTPUT FOR UMTS Rel 6 HSDPA

The following Sub-Tests were completed according to the test requirements outlined in section 5.2A of the 3GPP TS34.121-1 V7.5.0 specification. All TX RMS and Peak power requirements for Power Class 3 were met according to table 5.2AA.5 and achieved through the outlined test procedure in section 5.2AA.4.2. A summary of these settings are illustrated below:

|                               | Mode                                 | Rel6 HSDPA     | Rel6 HSDPA | Rel6 HSDPA | Rel6 HSDPA |
|-------------------------------|--------------------------------------|----------------|------------|------------|------------|
|                               | Subtest                              | 1              | 2          | 3          | 4          |
| WCDMA<br>General<br>Settings  | Loopback Mode                        | Test Mode 1    |            |            |            |
|                               | Rel99 RMC                            | 12.2kbps RMC   |            |            |            |
|                               | HSDPA FRC                            | H-Set1         |            |            |            |
|                               | HSUPA Test                           | Not Applicable |            |            |            |
|                               | Power Control Algorithm              | Algorithm 2    |            |            |            |
|                               | $\beta_c$                            | 2/15           | 12/15      | 15/15      | 15/15      |
|                               | $\beta_d$                            | 15/15          | 15/15      | 8/15       | 4/15       |
|                               | $\beta_{ec}$                         | -              | -          | -          | -          |
|                               | $\beta_c/\beta_d$                    | 2/15           | 12/15      | 15/8       | 15/4       |
|                               | $\beta_{hs}$                         | 4/15           | 24/15      | 30/15      | 30/15      |
| $\beta_{ed}$                  | Not Applicable                       |                |            |            |            |
| HSDPA<br>Specific<br>Settings | DACK                                 | 8              |            |            |            |
|                               | DNAK                                 | 8              |            |            |            |
|                               | DCQI                                 | 8              |            |            |            |
|                               | Ack-Nack repetition factor           | 3              |            |            |            |
|                               | CQI Feedback (Table 5.2B.4)          | 4ms            |            |            |            |
|                               | CQI Repetition Factor (Table 5.2B.4) | 2              |            |            |            |
|                               | $A_{hs} = \beta_{hs}/\beta_c$        | 30/15          |            |            |            |

## RESULTS

### REL 6 HSDPA

| Band                  | Subtest | UL Ch | DL Ch | Frequency | Conducted output power (dBm) |               |
|-----------------------|---------|-------|-------|-----------|------------------------------|---------------|
|                       |         |       |       |           | Average                      | Peak          |
| UMTS1710<br>(Band IV) | 1       | 1312  | 1537  | 1712.4    | 24.20                        | 28.49         |
|                       |         | 1412  | 1637  | 1732.4    | 24.10                        | 28.51         |
|                       |         | 1513  | 1738  | 1752.6    | 24.15                        | 28.63         |
|                       | 2*      | 1312  | 1537  | 1712.4    | <b>24.40</b>                 | <b>28.96*</b> |
|                       |         | 1412  | 1637  | 1732.4    | 24.10                        | 28.57         |
|                       |         | 1513  | 1738  | 1752.6    | 24.12                        | 28.65         |
|                       | 3       | 1312  | 1537  | 1712.4    | 24.08                        | 28.91         |
|                       |         | 1412  | 1637  | 1732.4    | 24.10                        | 28.79         |
|                       |         | 1513  | 1738  | 1752.6    | 24.15                        | 28.89         |
|                       | 4       | 1312  | 1537  | 1712.4    | 23.60                        | 28.62         |
|                       |         | 1412  | 1637  | 1732.4    | 23.60                        | 28.72         |
|                       |         | 1513  | 1738  | 1752.6    | 23.50                        | 28.68         |

### 9.3. RF POWER OUTPUT for UMTS– Rel 6 HSPA (HSDPA & HSUPA)

The following tests were completed according to the test requirements outlined in section 5.2 of the 3GPP TS34.121-1 V7.5.0 specification. The EUT supports power Class 3, which has a nominal maximum output power of 24 dBm (+1.7/-3.7) 12.2kps RMC is used for this testing. Power control set to All bits up. A summary of these settings are illustrated below:

|                               | Mode                                 | Rel6 HSUPA   | Rel6 HSUPA | Rel6 HSUPA   | Rel6 HSUPA | Rel6 HSUPA   |
|-------------------------------|--------------------------------------|--|------------|--|------------|--|
|                               | Subtest                              | 1  | 2          | 3  | 4          | 5  |
| WCDMA<br>General<br>Settings  | Loopback Mode                        | Test Mode 1  |            |  |            |  |
|                               | Rel99 RMC                            | 12.2kbps RMC   |            |  |            |  |
|                               | HSDPA FRC                            | H-Set1   |            |  |            |  |
|                               | HSUPA Test                           | HSUPA Loopback   |            |  |            |  |
|                               | Power Control Algorithm              | Algorithm2   |            |  |            |  |
|                               | $\beta_c$                            | 11/15  | 6/15       | 15/15  | 2/15       | 15/15  |
|                               | $\beta_d$                            | 15/15  | 15/15      | 9/15   | 15/15      | 15/15  |
|                               | $\beta_{ec}$                         | 209/225  | 12/15      | 30/15  | 2/15       | 24/15  |
|                               | $\beta_c/\beta_d$                    | 11/15  | 6/15       | 15/9   | 2/15       | 15/15  |
|                               | $\beta_{hs}$                         | 22/15  | 12/15      | 30/15  | 4/15       | 30/15  |
| HSDPA<br>Specific<br>Settings | $\beta_{ed}$                         | 1309/225   | 94/75      | 47/15<br>47/15                                     | 56/75      | 134/15   |
|                               | DACK                                 | 8  |            |  |            |  |
|                               | DNAK                                 | 8  |            |  |            |  |
|                               | DCQI                                 | 8  |            |  |            |  |
|                               | Ack-Nack repetition factor           | 3  |            |  |            |  |
|                               | CQI Feedback (Table 5.2B.4)          | 4ms  |            |  |            |  |
|                               | CQI Repetition Factor (Table 5.2B.4) | 2  |            |  |            |  |
| $A_{hs} = \beta_{hs}/\beta_c$ | 30/15                                |  |            |  |            |  |
| HSUPA<br>Specific<br>Settings | D E-DPCCH                            | 6  | 8          | 8  | 5          | 7  |
|                               | DHARQ                                | 0  | 0          | 0  | 0          | 0  |
|                               | AG Index                             | 20   | 12         | 15   | 17         | 21   |
|                               | ETFCI (from 34.121 Table C.11.1.3)   | 75   | 67         | 92   | 71         | 81   |
|                               | Associated Max UL Data Rate kbps     | 242.1  | 174.9      | 482.8  | 205.8      | 308.9  |
|                               | Reference E_TFCIs                    | E-TFCI 11<br>E-TFCI PO 4<br>E-TFCI 67<br>E-TFCI PO 18<br>E-TFCI 71<br>E-TFCI PO 23<br>E-TFCI 75<br>E-TFCI PO 26<br>E-TFCI 81<br>E-TFCI PO 27 |            | E-TFCI 11<br>E-TFCI PO 4<br>E-TFCI 92<br>E-TFCI PO | 18         | E-TFCI 11<br>E-TFCI PO 4<br>E-TFCI 67<br>E-TFCI PO 18<br>E-TFCI 71<br>E-TFCI PO 23<br>E-TFCI 75<br>E-TFCI PO 26<br>E-TFCI 81<br>E-TFCI PO 27 |

**RESULTS**

**REL 6 HSPA (HSDPA & HSUPA)**

| Band     | Subtest | UL Ch | DL Ch | Frequency | Conducted output power (dBm) |       |
|----------|---------|-------|-------|-----------|------------------------------|-------|
|          |         |       |       |           | Average                      | Peak  |
| UMTS1700 | 1       | 1312  | 1537  | 1712.4    | 24.15                        | 28.70 |
|          |         | 1412  | 1637  | 1732.4    | 24.00                        | 28.88 |
|          |         | 1513  | 1738  | 1752.6    | 24.10                        | 28.90 |
|          | 2       | 1312  | 1537  | 1712.4    | 22.54                        | 28.12 |
|          |         | 1412  | 1637  | 1732.4    | 22.58                        | 28.20 |
|          |         | 1513  | 1738  | 1752.6    | 22.52                        | 28.15 |
|          | 3       | 1312  | 1537  | 1712.4    | 23.16                        | 28.30 |
|          |         | 1412  | 1637  | 1732.4    | 23.20                        | 28.54 |
|          |         | 1513  | 1738  | 1752.6    | 23.10                        | 28.40 |
|          | 4       | 1312  | 1537  | 1712.4    | 22.40                        | 28.39 |
|          |         | 1412  | 1637  | 1732.4    | 22.60                        | 28.77 |
|          |         | 1513  | 1738  | 1752.6    | 22.50                        | 28.71 |
|          | 5       | 1312  | 1537  | 1712.4    | 24.13                        | 28.71 |
|          |         | 1412  | 1637  | 1732.4    | 24.20                        | 28.80 |
|          |         | 1513  | 1738  | 1752.6    | 24.10                        | 28.70 |



## 10. WORST-CASE CONFIGURATION AND MODE

Based on the following investigation results, see Section 6. RF POWER OUTPUT VERIFICATION. The highest peak power and enhanced data rate is the worst-case scenario for all measurements.

Worst case modes:

- Rel 99
- Rel 6 HSDPA Subtest 2

## 11. CONDUCTED TEST RESULTS

### 11.1. OCCUPIED BANDWIDTH

#### RULE PART(S)

FCC: §2.1049  
 IC: RSS-Gen, 4.6

#### LIMITS

For reporting purposes only

#### TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded.

#### MODES TESTED

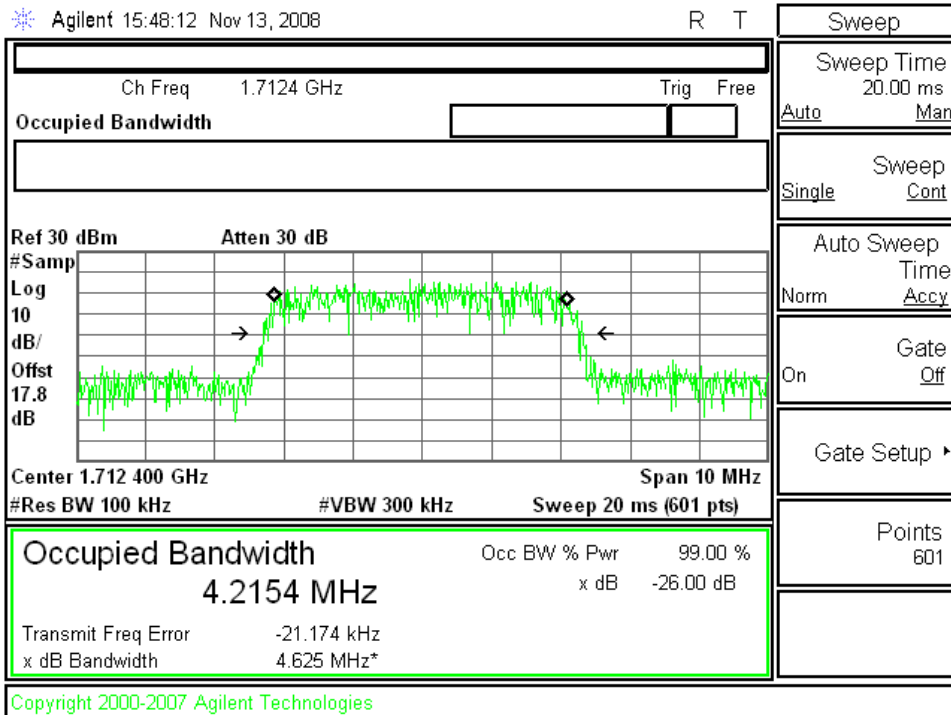
- UMTS (W-CDMA) - Rel 99, Rel 6 HSDPA Subtest 2

#### RESULTS

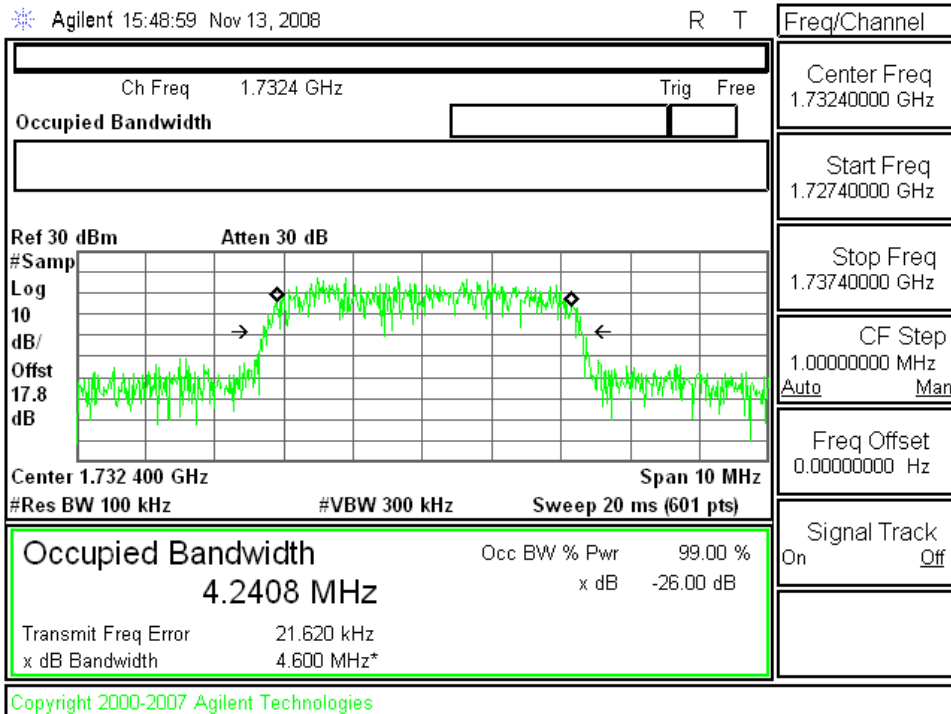
| Band                  | Mode                        | Channel | f (MHz) | 99% BW (MHz) | -26dB BW (MHz) |
|-----------------------|-----------------------------|---------|---------|--------------|----------------|
| UMTS1710<br>(Band IV) | Rel 99                      | 1312    | 1712.4  | 4.2154       | 4.625          |
|                       |                             | 1412    | 1732.4  | 4.2408       | 4.600          |
|                       |                             | 1513    | 1752.6  | 4.1597       | 4.647          |
|                       | HSDPA<br>Rel 6<br>Subtest 2 | 1312    | 1712.4  | 4.2006       | 4.618          |
|                       |                             | 1412    | 1732.4  | 4.1655       | 4.662          |
|                       |                             | 1513    | 1752.6  | 4.1601       | 4.609          |

**Plots for UMTS Rel 99 Mode**

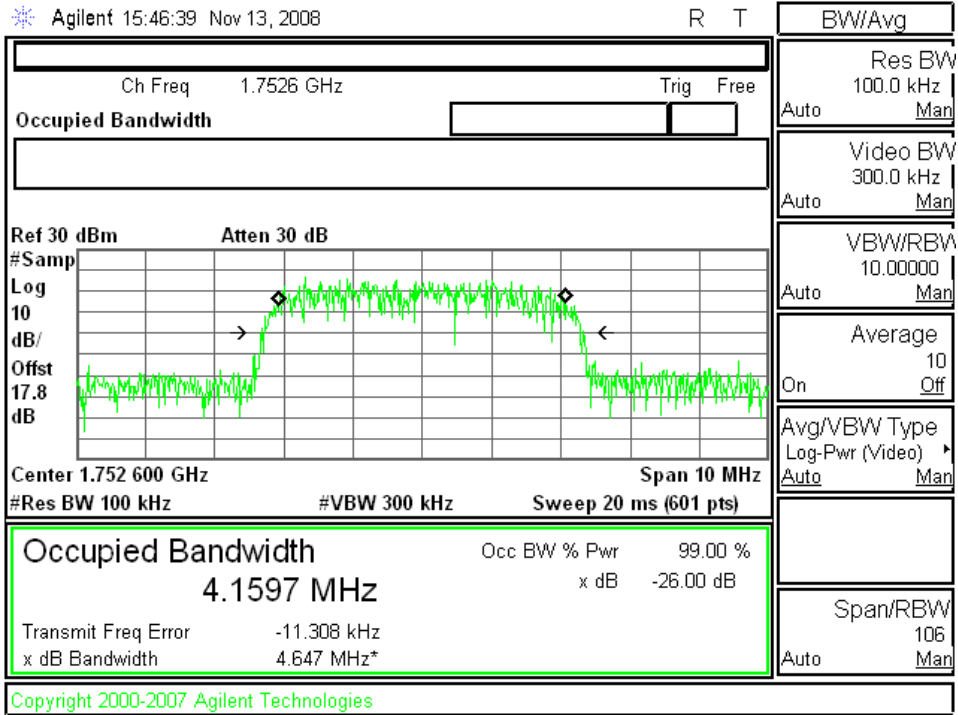
Rel 99, Ch 128



Rel99, Ch 1412

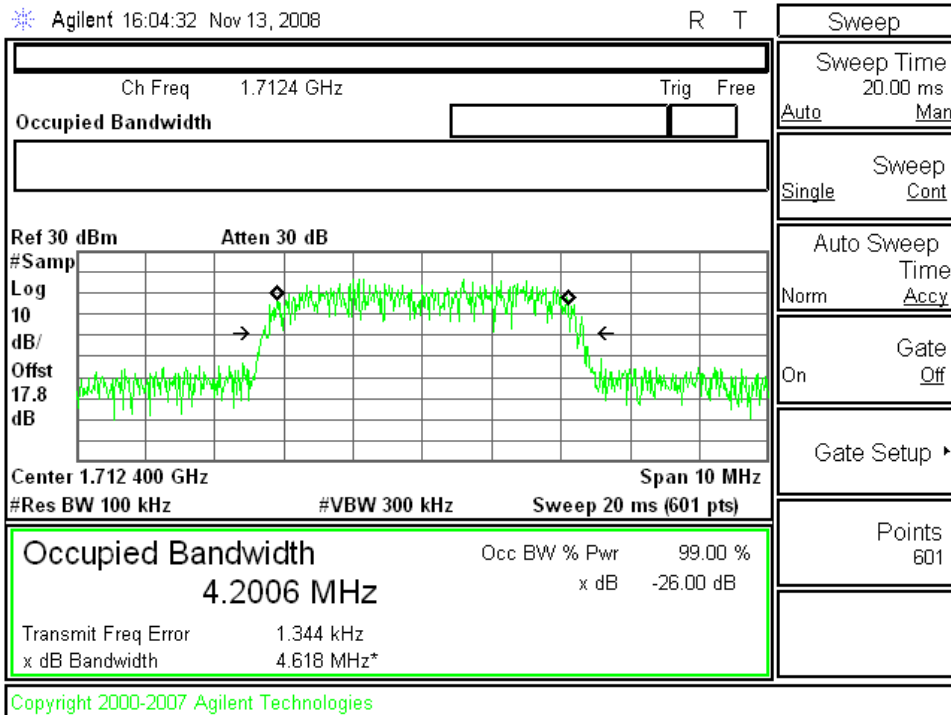


Rel 99, Ch 1513

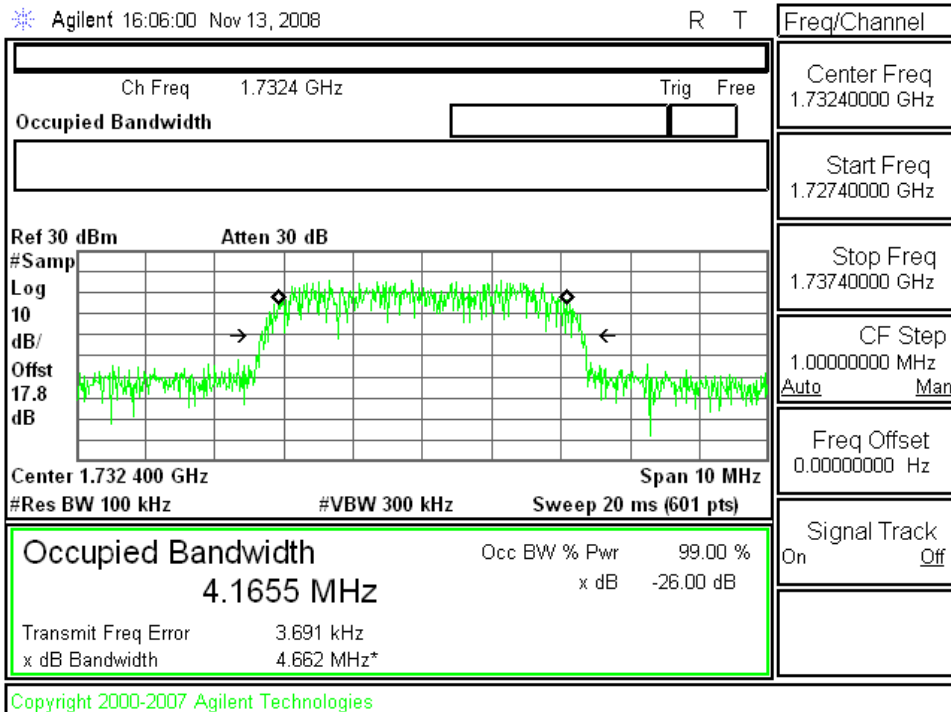


**Plots for Rel 6 HSDPA Subtest 2 Mode**

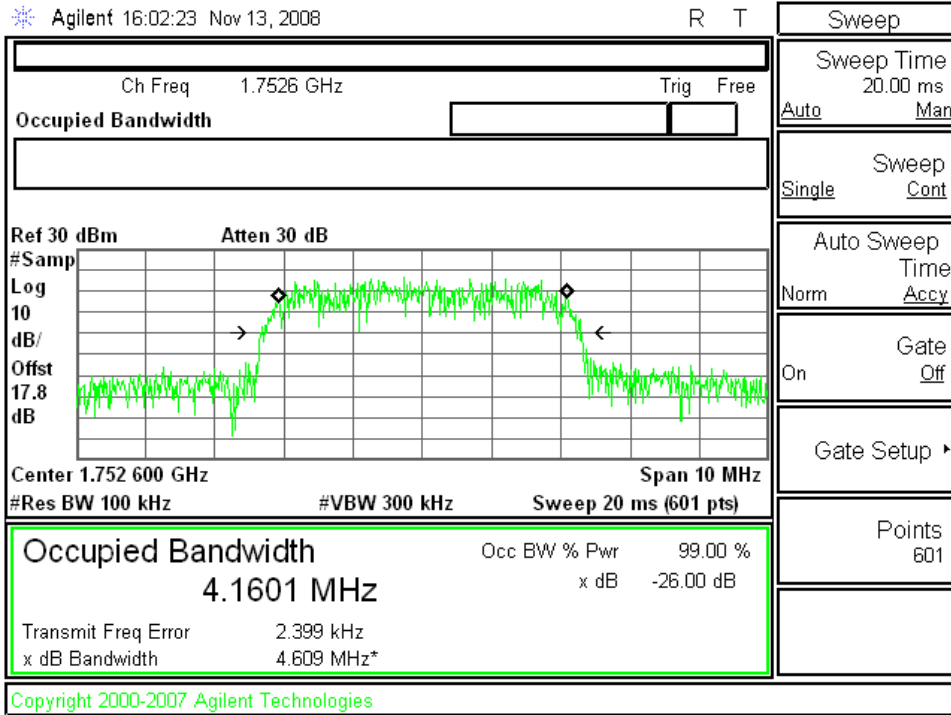
Rel 6 HSDPA Subtest 2, 1312



Rel 99 HSDPA Subtest 2, 1412



Rel 6 HSDPA Sub test 2, Ch1513



## **11.2. BAND EDGE**

### **RULE PART(S)**

FCC: §27.53  
IC: RSS-139, 6.5

### **LIMITS**

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.

### **TEST PROCEDURE**

The transmitter output was connected to a Agilent 8960 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

For each band edge measurement:

- Set the spectrum analyzer span to include the block edge frequency (1710 MHz and 1755 MHz)
- Set a marker to point the corresponding band edge frequency in each test case.
- Set display line at -13 dBm
- Set resolution bandwidth to at least 1% of emission bandwidth.

### **MODES TESTED**

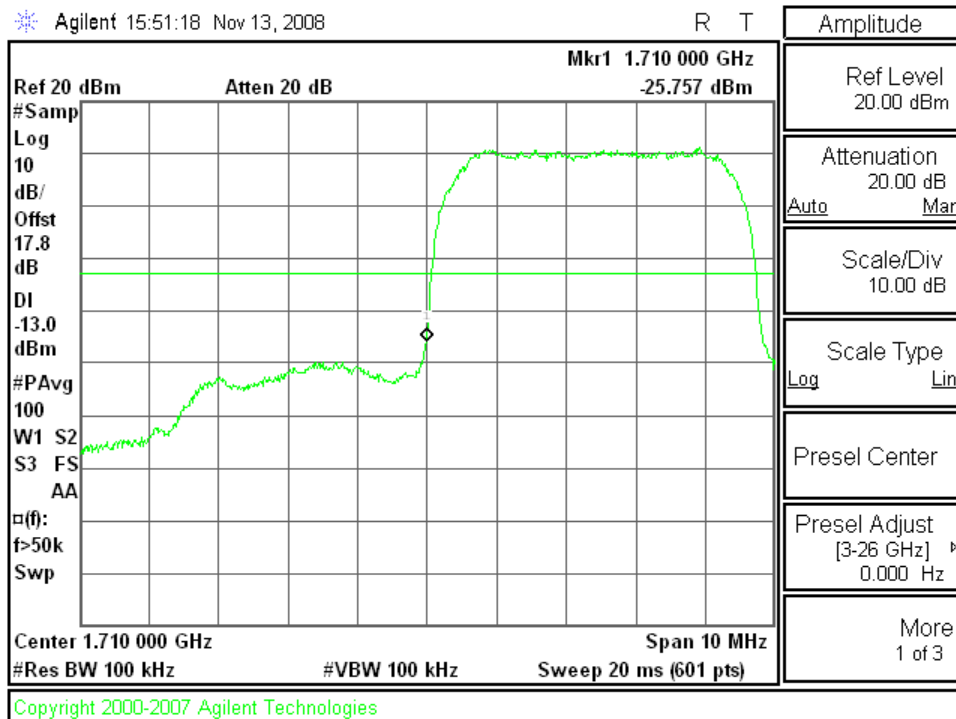
- GSM - GSM (GSMK) & EGPRS (8PSK),
- UMTS (W-CDMA) - Rel 99, Rel 6 HSDPA Subtest 2

### **RESULTS**

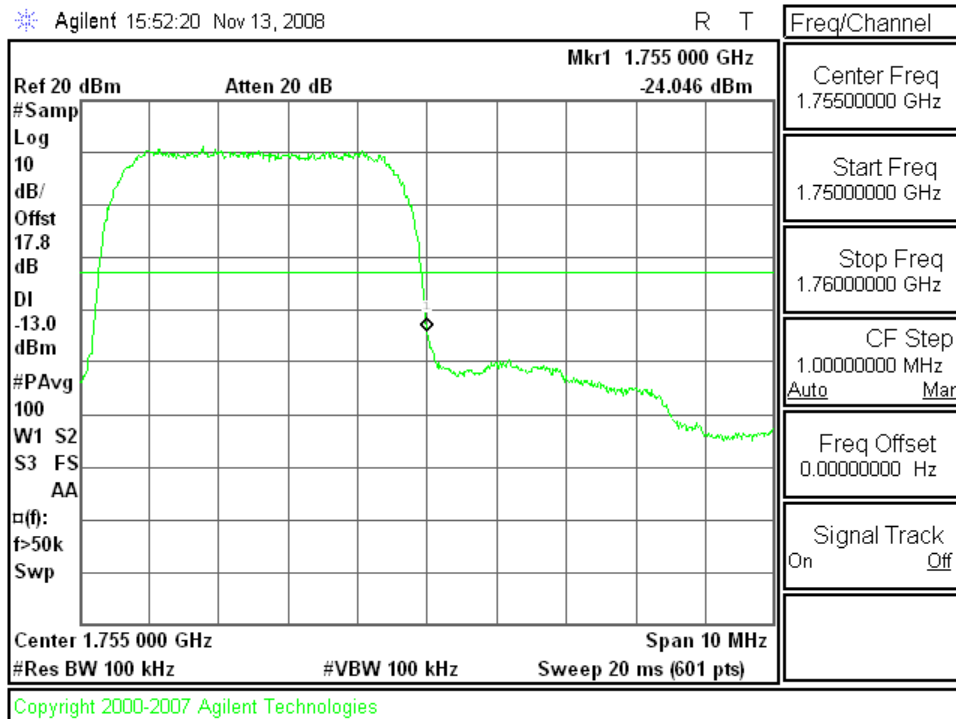
See the following pages.

**Plots for WCDMA REL99 Mode**

WCDMA REL99 (Low Ch)

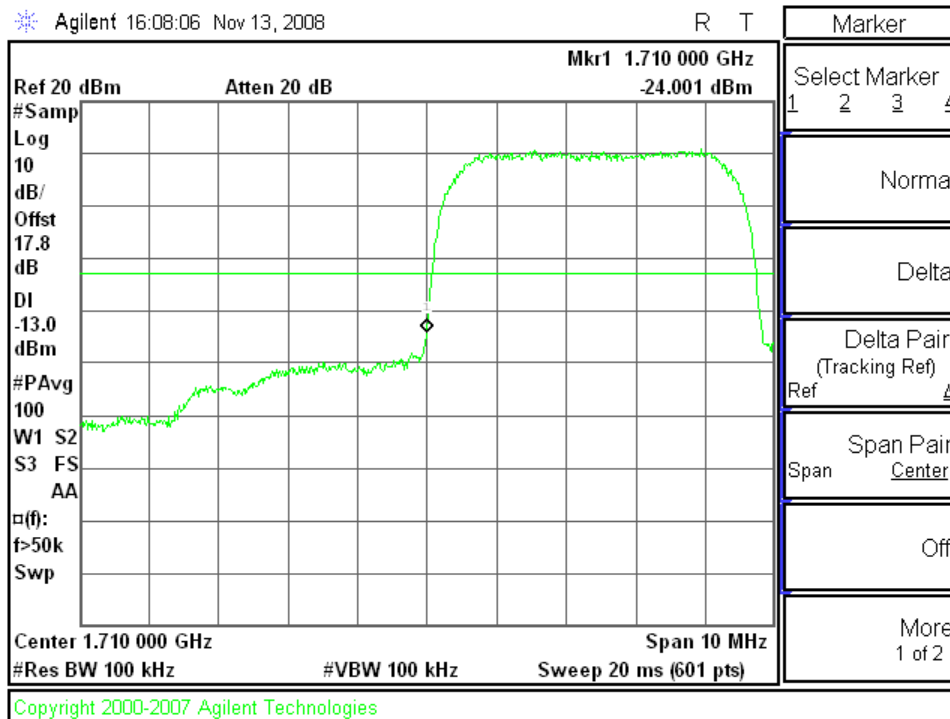


WCDMA REL99 ( High Ch )

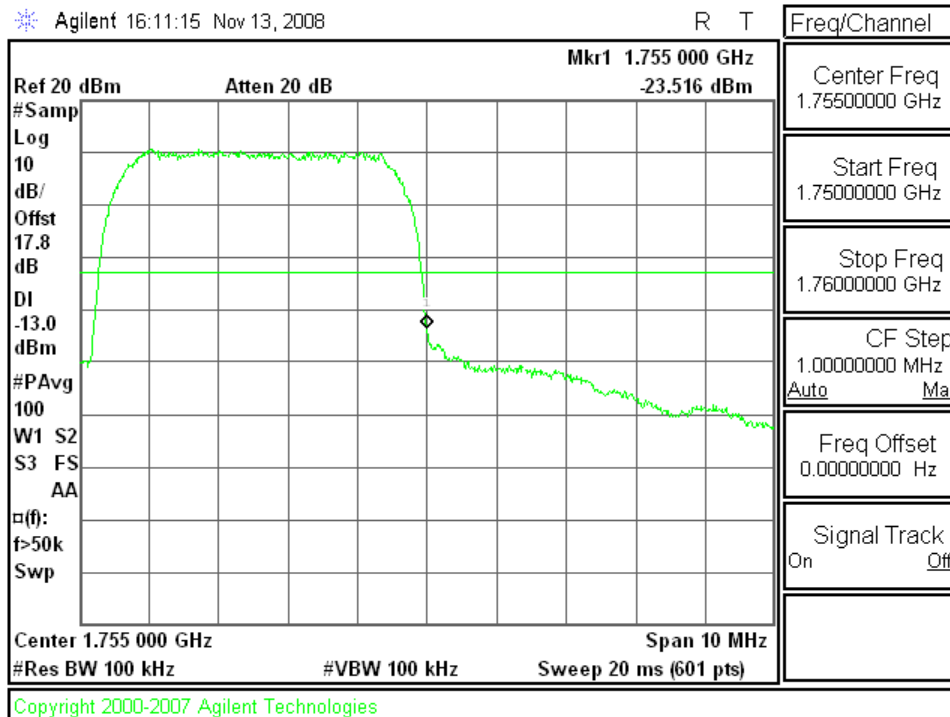




**Plots for WCDMA Rel 6 HSDPA Subtest 2 Mode**  
HSDPA Subtest 2 (Low Ch)



HSDPA Subtest 2 (High Ch)



### **11.3. OUT OF BAND EMISSIONS**

#### **RULE PART(S)**

FCC: §2.1051, §27.53  
IC: RSS-139, 6.5

#### **LIMITS**

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.

#### **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. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

- Set display line at -13 dBm
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.

#### **MODES TESTED**

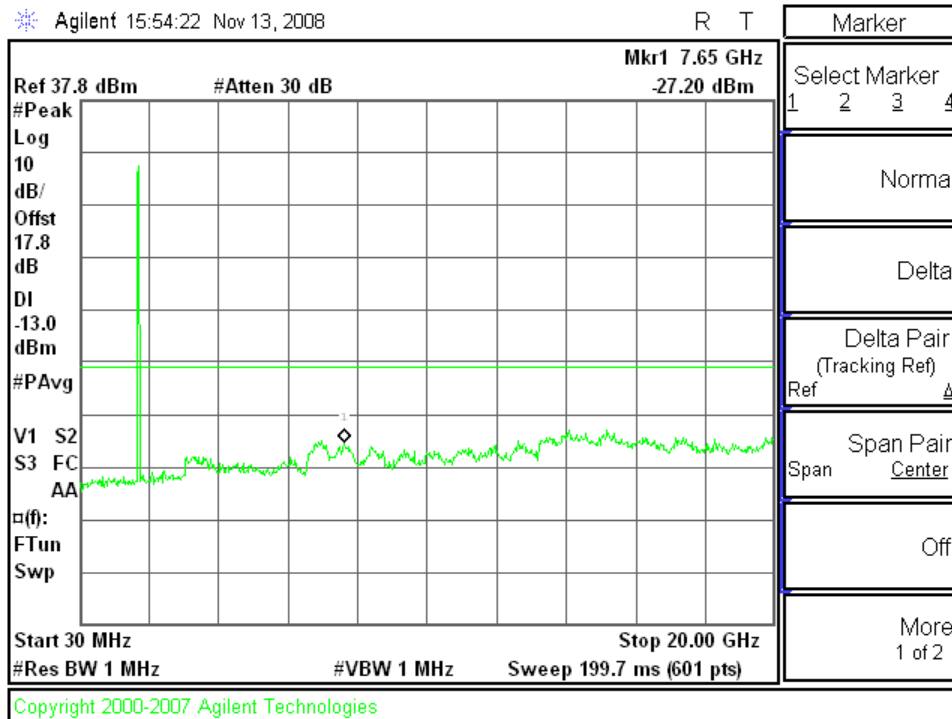
- UMTS (W-CDMA) - Rel 99, Rel 6 HSDPA Subtest 2

#### **RESULTS**

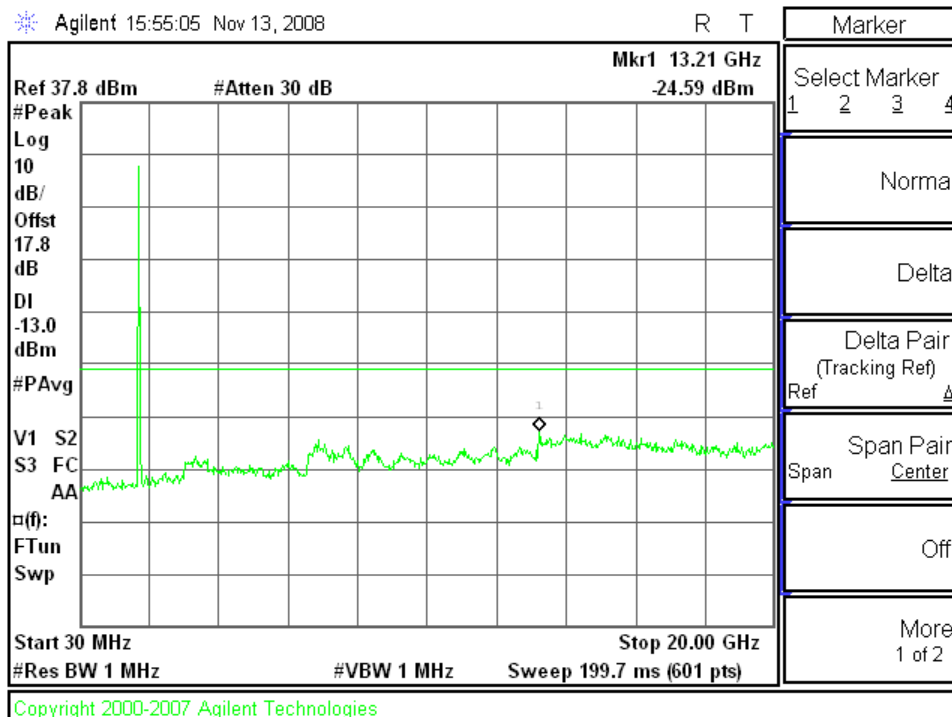
See the following pages.

**Plots for WCDMA Rel 99 Mode**

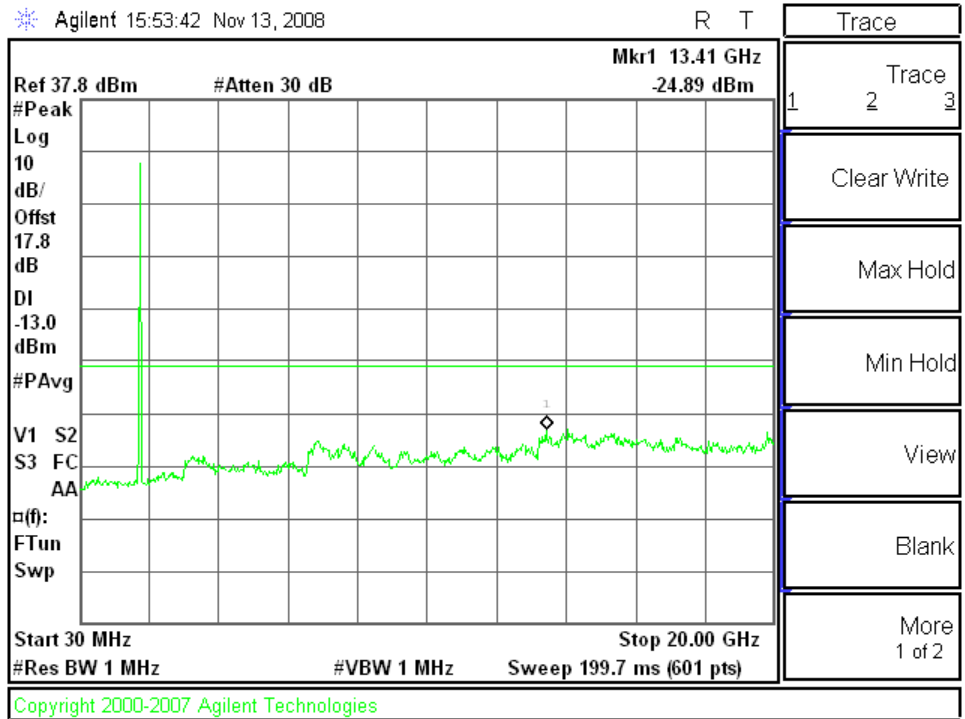
REL99 (Low Ch)



Rel 99 (Mid Ch)

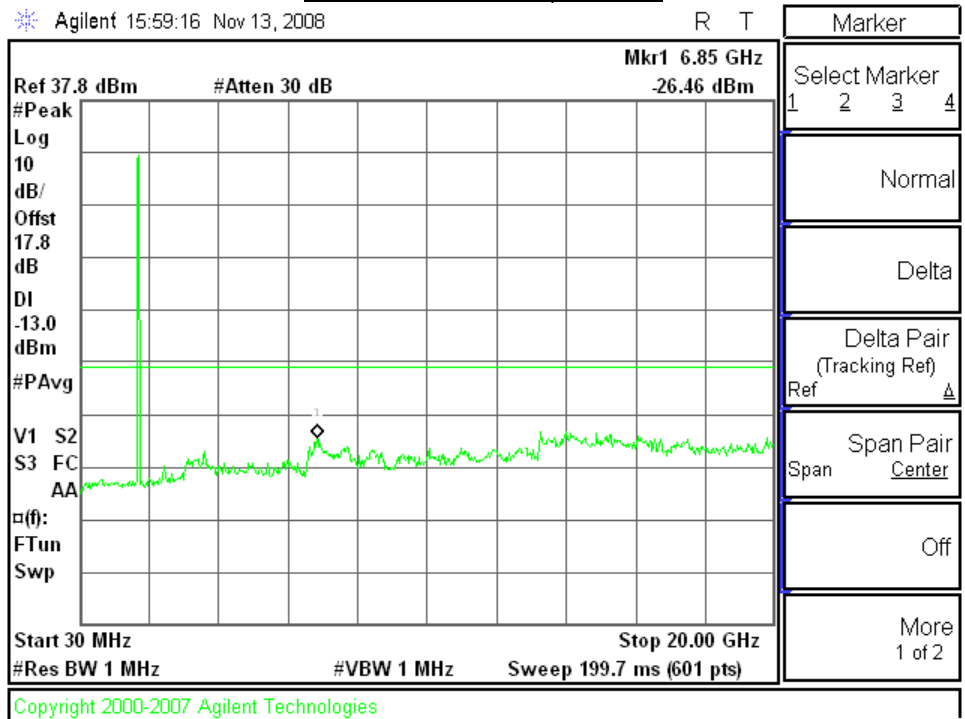


Rel 99 (High Ch)

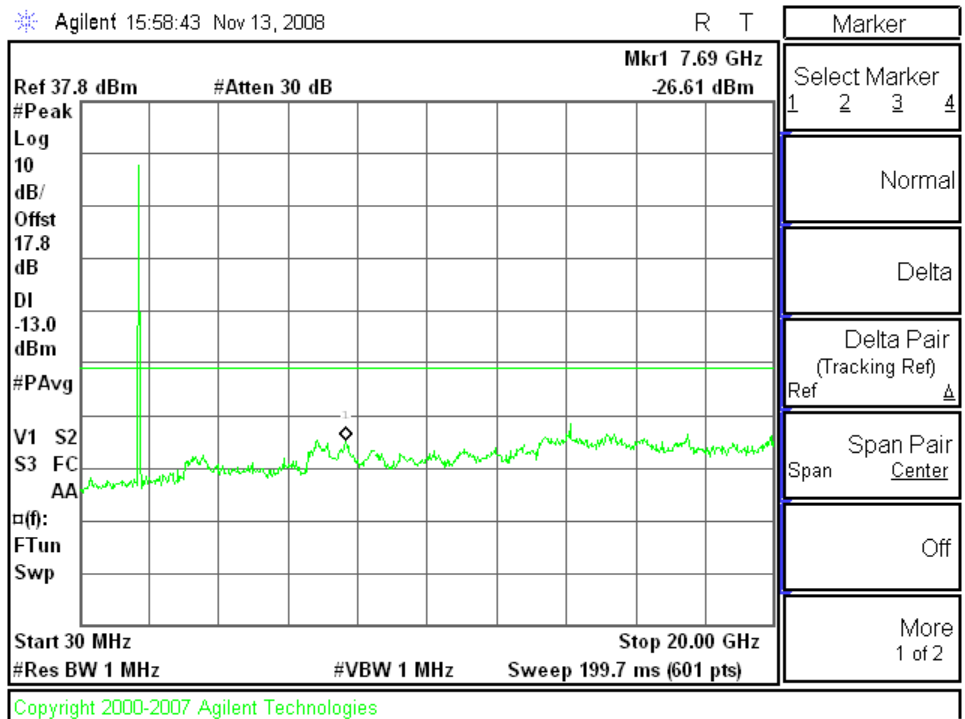


**Plots for HSDPA Subtest 2 Mode**

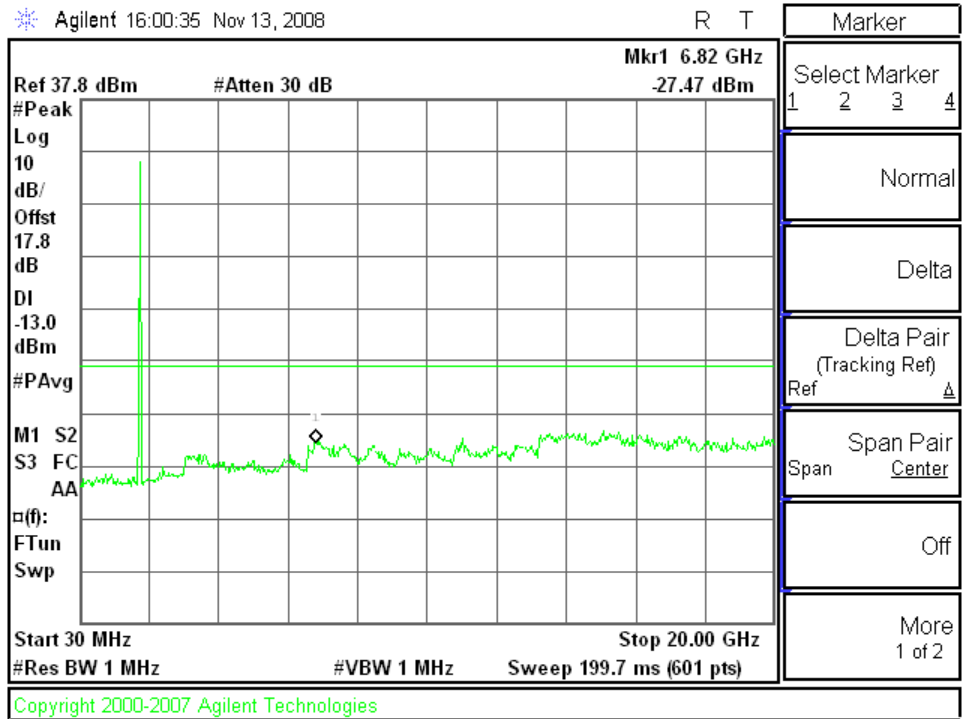
**HSDPA Subtest 2 ( Low Ch**



**HSDPA Subtest 2 (Mid Ch**



HSDPA Subtest 2 (High Ch)



## 11.4. FREQUENCY STABILITY

### RULE PART(S)

FCC: §2.1055, §27.54  
IC: RSS-139, 6.3

### LIMITS

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

### TEST PROCEDURE

Use Agilent 8960 with Frequency Error measurement capability.

- Temp. = -20° to +50°C
- Voltage = 3.3 Vdc
- 3.0 – 3.6 Vdc (85% - 115%)

#### **Frequency Stability vs Temperature:**

The EUT is placed inside a temperature chamber. The temperature is set to 20°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50°C is reached. Reference power supply voltage for these tests is 3.3 Vdc.

#### **Frequency Stability vs Voltage:**

The peak frequency error is recorded (worst-case). The test voltages are 3.0 to 3.6 Vdc.

### MODES TESTED

- UMTS (W-CDMA) - Rel 99

### RESULTS

See the following pages.

**AWS 1700 WCDMA MODULATION – MID CHANNEL**

| Reference Frequency: AWS WCDMA Mid Channel 1730.1511MHz @ 20°C  |                              |   |             |             |
|---|------------------------------|---|-------------|-------------|
| Limit: within the authorized block or +/- 2.5 ppm = 4325.378 Hz |                              |   |             |             |
| Power Supply (Vdc)  | Environment Temperature (*C) | Frequency Deviation Measured with Time Elapse |             |             |
|   |                              | (MHz)   | Delta (ppm) | Limit (ppm) |
| 4.20  | 50                           | 1730.15072                                    | 0.220       | 2.5         |
| 4.20  | 40                           | 1730.15105                                    | 0.029       | 2.5         |
| 4.20  | 30                           | 1730.15068                                    | 0.243       | 2.5         |
| <b>4.20</b>   | <b>20</b>                    | <b>1730.15110</b>                             | <b>0</b>    | <b>2.5</b>  |
| 4.20  | 10                           | 1730.15075                                    | 0.202       | 2.5         |
| 4.20  | 0                            | 1730.15113                                    | -0.017      | 2.5         |
| 4.20  | -10                          | 1730.15153                                    | -0.249      | 2.5         |
| 4.20  | -20                          | 1730.15145                                    | -0.202      | 2.5         |
| 4.20  | -30                          | 1730.15155                                    | -0.260      | 2.5         |

| Reference Frequency: PCS Mid Channel 1730.1511MHz @ 20°C        |                              |   |             |             |
|---|------------------------------|---|-------------|-------------|
| Limit: within the authorized block or +/- 2.5 ppm = 4325.378 Hz |                              |   |             |             |
| Power Supply (Vdc)  | Environment Temperature (*C) | Frequency Deviation Measured with Time Elapse |             |             |
|   |                              | (MHz)   | Delta (ppm) | Limit (ppm) |
| <b>100%</b>   | <b>20</b>                    | <b>1730.15110</b>                             | <b>0</b>    | <b>2.5</b>  |
| 85%   | 20                           | 1730.15142                                    | -0.185      | 2.5         |
| 115%  | 20                           | 1730.15150                                    | -0.231      | 2.5         |



## 12. RADIATED TEST RESULTS

### 12.1. RADIATED POWER (ERP & EIRP)

#### RULE PART(S)

FCC: §2.1046, §27.50(d) (2)  
IC: RSS-139, 6.4

#### LIMITS

27.50(d) (2) - The Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to a peak EIRP of 1 watt.

RSS-139 § 6.4 - The peak equivalent isotropically radiated power (e.i.r.p.) for fixed, mobile and portable transmitters in the 1710-1755 MHz shall not exceed 1 watt.

#### TEST PROCEDURE

ANSI / TIA / EIA 603C, RSS-139

#### MODES TESTED

- UMTS (W-CDMA) - Rel 99, Rel 6 HSDPA Subtest 2

#### RESULTS for Cellular Band (ERP)

| Mode                 | Channel | f (MHz) | EIRP  |        |
|----------------------|---------|---------|-------|--------|
|                      |         |         | dBm   | mW     |
| Rel 99               | 1312    | 1712.40 | 27.10 | 512.86 |
|                      | 1412    | 1733.00 | 27.00 | 501.19 |
|                      | 1513    | 1754.00 | 27.50 | 562.34 |
| HSDPA<br>(Subtest 2) | 1312    | 1712.40 | 26.20 | 416.87 |
|                      | 1412    | 1733.00 | 27.80 | 602.56 |
|                      | 1513    | 1754.00 | 27.20 | 524.81 |

**EIRP for Rel 99 Mode**

| High Frequency Fundamental Measurement                                      |                     |                 |                  |         |            |            |             |             |       |
|---|---------------------|-----------------|------------------|---------|------------|------------|-------------|-------------|-------|
| Compliance Certification Services, Fremont 5m Chamber Site                  |                     |                 |                  |         |            |            |             |             |       |
| Company: Qualcomm   |                     |                 |                  |         |            |            |             |             |       |
| Project #:08U12127  |                     |                 |                  |         |            |            |             |             |       |
| Date: 11/18/2008  |                     |                 |                  |         |            |            |             |             |       |
| Test Engineer: Chin Pang  |                     |                 |                  |         |            |            |             |             |       |
| Configuration: EUT with Magnetic Mount triple-frequency mobile antenna      |                     |                 |                  |         |            |            |             |             |       |
| Mode:AWS1700, WCDMA Rel 99  |                     |                 |                  |         |            |            |             |             |       |
| <b>Test Equipment:</b>  |                     |                 |                  |         |            |            |             |             |       |
| Receiving: Horn T73, and Chamber B 20ft S/N 228076 005                      |                     |                 |                  |         |            |            |             |             |       |
| Substitution: Horn T60Substitution, 4ft SMA Cable Warehouse S/N: 187215 001 |                     |                 |                  |         |            |            |             |             |       |
| f GHz   | SA reading (dBuV/m) | Ant. Pol. (H/V) | SG reading (dBm) | CL (dB) | Gain (dBi) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Notes |
| <b>Low Ch</b>   |                     |                 |                  |         |            |            |             |             |       |
| 1.712   | 96.4                | V               | 19.8             | 0.7     | 8.0        | 27.1       | 30.0        | -2.9        |       |
| 1.712   | 89.0                | H               | 12.1             | 0.7     | 8.0        | 19.4       | 30.0        | -10.6       |       |
| <b>Mid Ch</b>   |                     |                 |                  |         |            |            |             |             |       |
| 1.733   | 96.2                | V               | 19.7             | 0.7     | 8.0        | 27.0       | 30.0        | -3.0        |       |
| 1.733   | 89.5                | H               | 12.9             | 0.7     | 8.0        | 20.2       | 30.0        | -9.8        |       |
| <b>High Ch</b>  |                     |                 |                  |         |            |            |             |             |       |
| 1.754   | 96.7                | V               | 20.3             | 0.8     | 8.0        | 27.5       | 30.0        | -2.5        |       |
| 1.754   | 89.6                | H               | 12.9             | 0.8     | 8.0        | 20.1       | 30.0        | -9.9        |       |
| Rev. 1.24.7   |                     |                 |                  |         |            |            |             |             |       |

**EIRP for Rel 6 HSDPA Subtest 2 Mode**

| High Frequency Fundamental Measurement                                       |                     |                 |                  |         |            |            |             |             |       |
|--|---------------------|-----------------|------------------|---------|------------|------------|-------------|-------------|-------|
| Compliance Certification Services, Fremont 5m Chamber Site                   |                     |                 |                  |         |            |            |             |             |       |
| Company: Qualcomm  |                     |                 |                  |         |            |            |             |             |       |
| Project #:08U12127   |                     |                 |                  |         |            |            |             |             |       |
| Date: 11/18/2008   |                     |                 |                  |         |            |            |             |             |       |
| Test Engineer: Chin Pang   |                     |                 |                  |         |            |            |             |             |       |
| Configuration: EUT with Magnetic Mount triple-frequency mobile antenna       |                     |                 |                  |         |            |            |             |             |       |
| Mode:AWS1700, WCDMA+HSDPA  |                     |                 |                  |         |            |            |             |             |       |
| <b>Test Equipment:</b>   |                     |                 |                  |         |            |            |             |             |       |
| Receiving: Horn T73, and Chamber B 20ft S/N 228076 005                       |                     |                 |                  |         |            |            |             |             |       |
| Substitution: Horn T60 Substitution, 4ft SMA Cable Warehouse S/N: 187215 001 |                     |                 |                  |         |            |            |             |             |       |
| f GHz  | SA reading (dBuV/m) | Ant. Pol. (H/V) | SG reading (dBm) | CL (dB) | Gain (dBi) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Notes |
| <b>Low Ch</b>  |                     |                 |                  |         |            |            |             |             |       |
| 1.712  | 95.5                | V               | 18.9             | 0.7     | 8.0        | 26.2       | 30.0        | -3.8        |       |
| 1.712  | 88.1                | H               | 11.2             | 0.7     | 8.0        | 18.5       | 30.0        | -11.5       |       |
| <b>Mid Ch</b>  |                     |                 |                  |         |            |            |             |             |       |
| 1.733  | 97.0                | V               | 20.5             | 0.7     | 8.0        | 27.8       | 30.0        | -2.2        |       |
| 1.733  | 87.7                | H               | 11.1             | 0.7     | 8.0        | 18.4       | 30.0        | -11.6       |       |
| <b>High Ch</b>   |                     |                 |                  |         |            |            |             |             |       |
| 1.754  | 96.4                | V               | 20.0             | 0.8     | 8.0        | 27.2       | 30.0        | -2.9        |       |
| 1.754  | 86.5                | H               | 9.8              | 0.8     | 8.0        | 17.0       | 30.0        | -13.0       |       |
| Rev. 1.24.7  |                     |                 |                  |         |            |            |             |             |       |

## **12.2. FIELD STRENGTH OF SPURIOUS RADIATION**

### **RULE PART(S)**

FCC: §2.1053, §27.53  
IC: RSS-139, 6.5

### **LIMIT**

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.

### **TEST 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.

### **MODES TESTED**

- UMTS (W-CDMA) - Rel 99, Rel 6 HSDPA Subtest 2

### **RESULTS**

See the following pages.

**Rel 99 Mode**

**High Frequency Substitution Measurement**  
 Compliance Certification Services, Fremont 3m C-Chamber

Company: Qualcomm  
 Project #: 08U12127  
 Date: 11/19/2008  
 Test Engineer: Chin Pang  
 Configuration: EUT with Magnetic Mount triple-frequency mobile antenna  
 Mode: AWS1700, WCDMA Rel99

**Test Equipment:**

EMCO Horn 1-18 GHz      Horn > 18GHz      Limit       High Pass Filter

T60; S/N: 2238 @3m      FCC 27

Hi Frequency Cables

(2' Chin 17707903)     (2~3', Thanh 187213003)     (12' S/N: 208948002)

Pre-amplifier 1-26GHz      Pre-amplifier 26-40GHz

T34 HP 8449B

| f GHz                     | SA reading (dBuV/m) | Ant. Pol. (H/V) | SG reading (dBm) | CL (dB) | Gain (dBi) | Gain (dBd) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Notes |
|---------------------------|---------------------|-----------------|------------------|---------|------------|------------|------------|-------------|-------------|-------|
| <b>Low Ch, 1712.4MHz</b>  |                     |                 |                  |         |            |            |            |             |             |       |
| 3.425                     | 43.8                | H               | -59.8            | 3.1     | 9.5        | 7.4        | -53.4      | -13.0       | -40.4       |       |
| 5.137                     | 39.0                | H               | -60.6            | 3.2     | 11.0       | 8.9        | -52.8      | -13.0       | -39.8       |       |
| 3.425                     | 45.6                | V               | -58.1            | 3.1     | 9.5        | 7.4        | -51.7      | -13.0       | -38.7       |       |
| 5.137                     | 39.5                | V               | -61.1            | 3.2     | 11.0       | 8.9        | -53.3      | -13.0       | -40.3       |       |
| <b>Mid Ch, 1732.4MHz</b>  |                     |                 |                  |         |            |            |            |             |             |       |
| 3.465                     | 42.8                | H               | -60.7            | 3.1     | 9.5        | 7.4        | -54.3      | -13.0       | -41.3       |       |
| 5.197                     | 38.6                | H               | -60.8            | 3.2     | 11.0       | 8.9        | -53.0      | -13.0       | -40.0       |       |
| 3.465                     | 44.5                | V               | -59.1            | 3.1     | 9.5        | 7.4        | -52.7      | -13.0       | -39.7       |       |
| 5.197                     | 39.5                | V               | -60.9            | 3.2     | 11.0       | 8.9        | -53.1      | -13.0       | -40.1       |       |
| <b>High Ch, 1752.6MHz</b> |                     |                 |                  |         |            |            |            |             |             |       |
| 3.505                     | 42.6                | H               | -60.8            | 3.1     | 9.6        | 7.4        | -54.3      | -13.0       | -41.3       |       |
| 5.258                     | 39.2                | H               | -60.0            | 3.3     | 11.0       | 8.8        | -52.3      | -13.0       | -39.3       |       |
| 3.505                     | 43.6                | V               | -59.9            | 3.1     | 9.6        | 7.4        | -53.4      | -13.0       | -40.4       |       |
| 5.258                     | 39.8                | V               | -60.4            | 3.3     | 11.0       | 8.8        | -52.7      | -13.0       | -39.7       |       |

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**Relo 6 HSDPA Subtest 2 Mode**

**High Frequency Substitution Measurement**  
 Compliance Certification Services, Fremont 3m C-Chamber

Company: Qualcomm  
 Project #: 08U12127  
 Date: 11/19/2008  
 Test Engineer: Chin Pang  
 Configuration: EUT with Magnetic Mount triple-frequency mobile antenna  
 Mode: AWS1700, WCDMA+HSDPA

**Test Equipment:**

EMCO Horn 1-18GHz

T60; S/N: 2238 @3m

Horn > 18GHz

Limit

FCC 27

High Pass Filter

Hi Frequency Cables

(2' Chin  
17707903)

(2 ~ 3', Thanh  
187215003)

(12' S/N:  
208946002)

Pre-amplifier 1-26GHz

T34 HP 8449B

Pre-amplifier 26-40GHz

| f GHz                     | SA reading (dBuV/m) | Ant. Pol. (H/V) | SG reading (dBm) | CL (dB) | Gain (dBi) | Gain (dBd) | EIRP (dBm) | Limit (dBm) | Margin (dB) | Notes |
|---------------------------|---------------------|-----------------|------------------|---------|------------|------------|------------|-------------|-------------|-------|
| <b>Low Ch, 1712.4MHz</b>  |                     |                 |                  |         |            |            |            |             |             |       |
| 3.425                     | 43.0                | H               | -60.6            | 3.1     | 9.5        | 7.4        | -54.2      | -13.0       | -41.2       |       |
| 5.137                     | 39.0                | H               | -60.6            | 3.2     | 11.0       | 8.9        | -52.8      | -13.0       | -39.8       |       |
| 3.425                     | 44.4                | V               | -59.3            | 3.1     | 9.5        | 7.4        | -52.9      | -13.0       | -39.9       |       |
| 5.137                     | 39.0                | V               | -61.6            | 3.2     | 11.0       | 8.9        | -53.8      | -13.0       | -40.8       |       |
| <b>Mid Ch, 1732.4MHz</b>  |                     |                 |                  |         |            |            |            |             |             |       |
| 3.465                     | 42.5                | H               | -61.0            | 3.1     | 9.5        | 7.4        | -54.6      | -13.0       | -41.6       |       |
| 5.197                     | 38.6                | H               | -60.8            | 3.2     | 11.0       | 8.9        | -53.0      | -13.0       | -40.0       |       |
| 3.465                     | 45.0                | V               | -58.6            | 3.1     | 9.5        | 7.4        | -52.2      | -13.0       | -39.2       |       |
| 5.197                     | 39.5                | V               | -60.9            | 3.2     | 11.0       | 8.9        | -53.1      | -13.0       | -40.1       |       |
| <b>High Ch, 1752.6MHz</b> |                     |                 |                  |         |            |            |            |             |             |       |
| 3.505                     | 43.0                | H               | -60.4            | 3.1     | 9.6        | 7.4        | -53.9      | -13.0       | -40.9       |       |
| 5.258                     | 38.8                | H               | -60.4            | 3.3     | 11.0       | 8.8        | -52.7      | -13.0       | -39.7       |       |
| 3.505                     | 44.0                | V               | -59.5            | 3.1     | 9.6        | 7.4        | -53.0      | -13.0       | -40.0       |       |
| 5.258                     | 40.0                | V               | -60.2            | 3.3     | 11.0       | 8.8        | -52.5      | -13.0       | -39.5       |       |

Rev. 8.19.8

### 12.3. RECEIVER SPURIOUS EMISSIONS

#### RULE PART(S)

FCC: N/A  
IC: RSS-139, 6.6, RSS-Gen

#### LIMIT

RSS-Gen 6 (a) - If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 1.

Table 1 - Spurious Emission Limits for Receivers:

| Spurious Frequency (MHz) | Field Strength(microvolt/m at 3 meters) |
|--------------------------|---|
| 30 - 88                  | 100                                     |
| 88 - 216                 | 150                                     |
| 216 - 960                | 200                                     |
| Above 960                | 500                                     |

#### TEST PROCEDURE

RSS-Gen 4.10 - The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

#### RESULTS

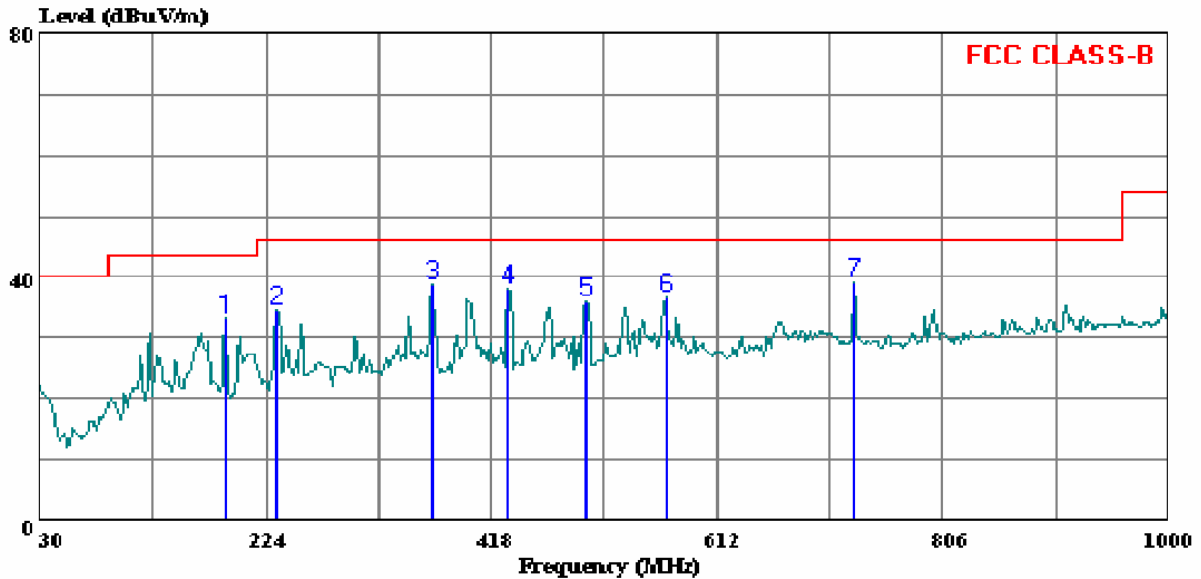
See the following pages.

**RECEIVER SPURIOUS EMISSIONS FOR 30 TO 1000 MHz, HORIZONTAL**



Compliance Certification Services  
 47173 Benicia Street  
 Fremont, CA 94538  
 Tel: (510) 771-1000  
 Fax: (510) 661-0888

Data#: 30 File#: 08u12127.emi Date: 11-26-2008 Time: 08:58:51



Trace: 19

Ref Trace:

Condition: FCC CLASS-B HORIZONTAL  
 Test Operator:: Chin Pang  
 Project #: : 08U12127  
 Company: : Qualcomm  
 Configuration:: EUT and antenna  
 Mode : : RX  
 Target: : FCC Class B

Page: 1

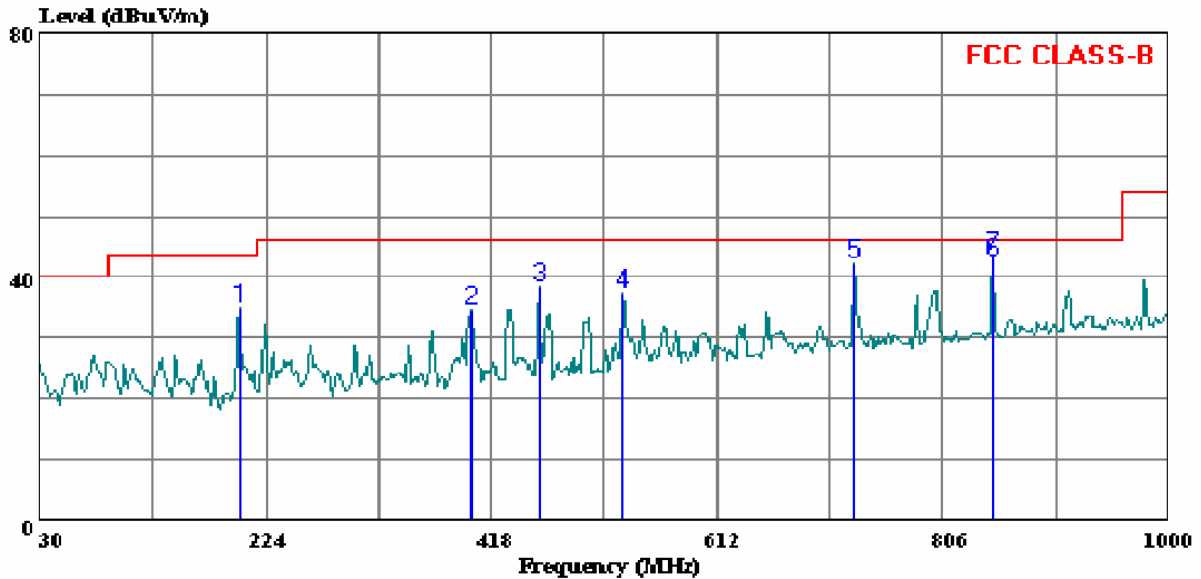
|      | Read    |        | Limit  | Over   |       |             |
|------|---------|--------|--------|--------|-------|-------------|
| Freq | Level   | Factor | Level  | Line   | Limit | Remark      |
| MHz  | dBuV    | dB     | dBuV/m | dBuV/m | dB    |             |
| 1    | 189.080 | 47.19  | -13.89 | 33.30  | 43.50 | -10.20 Peak |
| 2    | 232.730 | 47.64  | -13.15 | 34.49  | 46.00 | -11.51 Peak |
| 3    | 366.590 | 47.91  | -9.16  | 38.75  | 46.00 | -7.25 Peak  |
| 4    | 431.580 | 45.31  | -7.11  | 38.20  | 46.00 | -7.80 Peak  |
| 5    | 499.480 | 40.94  | -4.79  | 36.15  | 46.00 | -9.85 Peak  |
| 6    | 567.380 | 40.14  | -3.48  | 36.66  | 46.00 | -9.34 Peak  |
| 7    | 730.340 | 39.29  | -0.04  | 39.25  | 46.00 | -6.75 Peak  |

**RECEIVER SPURIOUS EMISSIONS FOR 30 TO 1000 MHz, VERTICAL**



Compliance Certification Services  
 47173 Benicia Street  
 Fremont, CA 94538  
 Tel: (510) 771-1000  
 Fax: (510) 661-0888

Data#: 29 File#: 08u12127.emi Date: 11-26-2008 Time: 08:44:50



Trace: 11

Ref Trace:

Condition: FCC CLASS-B VERTICAL  
 Test Operator:: Chin Pang  
 Project #: : 08U12127  
 Company: : Qualcomm  
 Configuration:: EUT and antenna  
 Mode : : RX  
 Target: : FCC class B

Page: 1

|   | Freq    | Read Level | Factor | Level  | Limit Line | Over Limit | Remark |
|---|---------|------------|--------|--------|------------|------------|--------|
|   | MHz     | dBuV       | dB     | dBuV/m | dBuV/m     | dB         |        |
| 1 | 201.690 | 47.97      | -12.98 | 34.99  | 43.50      | -8.51      | Peak   |
| 2 | 400.540 | 42.70      | -8.18  | 34.52  | 46.00      | -11.48     | Peak   |
| 3 | 458.740 | 44.46      | -6.18  | 38.28  | 46.00      | -7.72      | Peak   |
| 4 | 531.490 | 41.54      | -4.18  | 37.36  | 46.00      | -8.64      | Peak   |
| 5 | 730.340 | 42.16      | -0.04  | 42.12  | 46.00      | -3.88      | Peak   |
| 6 | 848.680 | 40.68      | 1.74   | 42.42  | 46.00      | -3.58      | QP     |
| 7 | 848.680 | 41.78      | 1.74   | 43.52  | 46.00      | -2.48      | Peak   |



### 13. MAXIMUM PERMISSIBLE EXPOSURE

#### LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency range (MHz)                                   | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm <sup>2</sup> ) | Averaging time (minutes) |
|---|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| (A) Limits for Occupational/Controlled Exposures        |                               |                               |                                     |                          |
| 0.3–3.0 .....   | 614                           | 1.63                          | *(100)                              | 6                        |
| 3.0–30 .....  | 1842/f                        | 4.89/f                        | *(900/f <sup>2</sup> )              | 6                        |
| 30–300 .....  | 61.4                          | 0.163                         | 1.0                                 | 6                        |
| 300–1500 .....  | .....                         | .....                         | f/300                               | 6                        |
| 1500–100,000 .....                                      | .....                         | .....                         | 5                                   | 6                        |
| (B) Limits for General Population/Uncontrolled Exposure |                               |                               |                                     |                          |
| 0.3–1.34 .....  | 614                           | 1.63                          | *(100)                              | 30                       |
| 1.34–30 .....   | 824/f                         | 2.19/f                        | *(180/f <sup>2</sup> )              | 30                       |

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm <sup>2</sup> ) | Averaging time (minutes) |
|-----------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| 30–300 .....          | 27.5                          | 0.073                         | 0.2                                 | 30                       |
| 300–1500 .....        | .....                         | .....                         | f/1500                              | 30                       |
| 1500–100,000 .....    | .....                         | .....                         | 1.0                                 | 30                       |

f = frequency in MHz

\* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

### CALCULATIONS

Given

$$E = \sqrt{(30 * P * G) / d}$$

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

$$d = \sqrt{((30 * P * G) / (3770 * S))}$$

Changing to units of Power to mW and Distance to cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = 100 * d \text{ (m)}$$

yields

$$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$$

$$d = 0.282 * \sqrt{(P * G / S)}$$

where

d = distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power Density in mW/cm<sup>2</sup>

Substituting the logarithmic form of power and gain using:

$$P \text{ (mW)} = 10^{(P \text{ (dBm)} / 10)} \text{ and}$$

$$G \text{ (numeric)} = 10^{(G \text{ (dBi)} / 10)}$$

yields

$$d = 0.282 * 10^{((P + G) / 20)} / \sqrt{S} \quad \text{Equation (1)}$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm<sup>2</sup>

Equation (1) and the measured peak power is used to calculate the MPE distance.

**LIMITS**

From §1.1310 Table 1 (B), S = 0.549 mW/cm<sup>2</sup> (Cell) and 1.0 mW/cm<sup>2</sup> (PCS)

**RESULTS**

No non-compliance noted: (MPE distance equals 20 cm)

| Modulation    | MPE Distance (cm) | Output Power (dBm) | Antenna Gain (dBi) | Power Density (mW/cm <sup>2</sup> ) | FCC MPE Limit (mW/cm <sup>2</sup> ) |
|---------------|-------------------|--------------------|--------------------|-------------------------------------|-------------------------------------|
| UMTS - Rel 99 | 20.0              | 28.80              | 0.00               | 0.151                               | 1.0                                 |
| UMTS - HSDPA  | 20.0              | 29.20              | 0.00               | 0.165                               | 1.0                                 |

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.