



**FCC CFR47 PART 22 SUBPART H
FCC CFR47 PART 24 SUBPART E
INDUSTRY CANADA RSS-132 ISSUE 2
INDUSTRY CANADA RSS-133 ISSUE 5**

**CERTIFICATION TEST REPORT
FOR**

**DUAL- BAND CDMA (1XRTT) MODULE
MODEL NUMBER: AR3550**

**FCC ID: N7NAR3550
IC: 2417C-AR3550**

REPORT NUMBER: 10U13450-3

ISSUE DATE: DECEMBER 13, 2010

Prepared for

**SIERRA WIRELESS INC. - YW
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NVLAP LAB CODE 200065-0

Revision History

| Rev. | Issue Date | Revisions | Revised By |
|------|---------------|---------------|------------|
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SIERRA WIRELESS INC. - YW
13811 WIRELESS WAY
RICHMOND, BRITISH COLUMBIA V6V3A4, CANADA

EUT DESCRIPTION: DUAL- BAND CDMA (1XRTT) MODULE

MODEL: AR3550

SERIAL NUMBER: 1026060032 (Conducted); A10000049000DF (Radiated)

DATE TESTED: OCTOBER 5 TO NOVEMBER 24, 2010

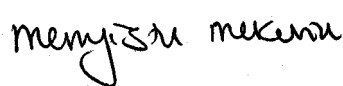
| APPLICABLE STANDARDS | |
|--------------------------------------|--------------|
| STANDARD | TEST RESULTS |
| FCC PART 22H & 24E | Pass |
| IC RSS-132 ISSUE 2 & RSS-133 ISSUE 5 | Pass |

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. 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 UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

Tested By:



THU CHAN
ENGINEERING MANAGER
UL CCS

MENGISTU MEKURIA
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA-603-C, FCC CFR 47 Part 2, FCC CFR 47 Part 22, FCC CFR Part 24, RSS-132 Issue 2 and RSS-133 Issue 5.

3. FACILITIES AND ACCREDITATION

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

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

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. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

4.3. MEASUREMENT UNCERTAINTY

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

| PARAMETER | UNCERTAINTY |
|---------------------------------------|-------------|
| Conducted Disturbance, 0.15 to 30 MHz | 3.52 dB |
| Radiated Disturbance, 30 to 1000 MHz | 4.94 dB |

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Dual- Band CDMA (1XRTT) Radio Module that is manufactured by Sierra Wireless.

GENERAL INFORMATION

| | |
|--|-----------------|
| Power Requirements | 5.2 VDC/1.2A |
| List of frequencies generated or used by the EUT | 32KHz & 19.2MHz |

5.2. MAXIMUM OUTPUT POWER

The transmitter has a peak ERP & EIRP output powers as follows:

Part 22 Cellular Band

| Frequency range (MHz) | Modulation | Conducted | | ERP | |
|-----------------------|------------|-----------|---------|--------|---------|
| | | dBm | mW | dBm | mW |
| 824.7 – 848.31 | 1xRTT | 29.750 | 944.061 | 28.900 | 776.247 |

Part 24 PCS Band

| Frequency range (MHz) | Modulation | Conducted | | EIRP | |
|-----------------------|------------|-----------|-------|-------|--------|
| | | dBm | mW | dBm | mW |
| 1851.25 – 1908.75 | 1xRTT | 29.70 | 933.3 | 30.00 | 1000.0 |

5.3. SOFTWARE AND FIRMWARE

The EUT is linked with 8960 Agilent Wireless Communication Test Set.

5.4. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power.

Based on the investigation results, the highest peak power is the worst-case scenario for all measurements.

Worst-case modes:

- Cellular & PCS Bands:
 - CDMA 1xRTT

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

| PERIPHERAL SUPPORT EQUIPMENT LIST | | | | |
|-----------------------------------|-----------------|---------|--------------------------|--------|
| Description | Manufacturer | Model | Serial Number | FCC ID |
| Development Kit | Sierra Wireless | ARx550 | 1400476 Rev A | N/A |
| Interface Jig | Sierra Wireless | N/a | 1400475 Rev A | N/A |
| AC/DC Adapter | CINCON ELEC. | TR45A12 | 45120-0054164 | DoC |
| Laptop | Dell | D610 | CN-0M7181-48643-66P-3523 | DoC |
| AC/DC Adapter | Dell | | CN-09T215-71615-55A-0614 | DoC |

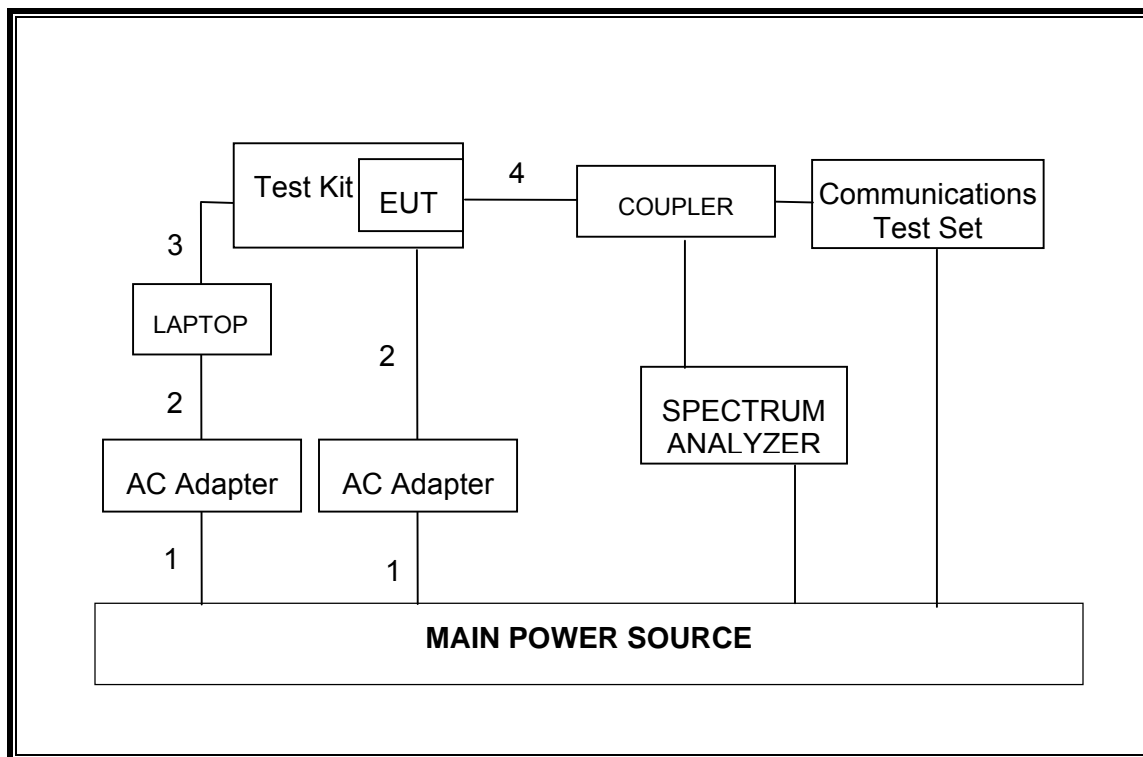
I/O CABLES

| I/O CABLE LIST | | | | | | |
|----------------|------|----------------------|----------------|-------------|--------------|---------|
| Cable No. | Port | # of Identical Ports | Connector Type | Cable Type | Cable Length | Remarks |
| 1 | AC | 2 | AC | Un-shielded | 2.0m | N/A |
| 2 | DC | 2 | DC | Un-shielded | 2.0m | N/A |
| 3 | USB | 1 | USB | Un-shielded | 2.0m | N/A |
| 4 | SMA | 1 | SMA | Shielded | 0.8m | N/A |

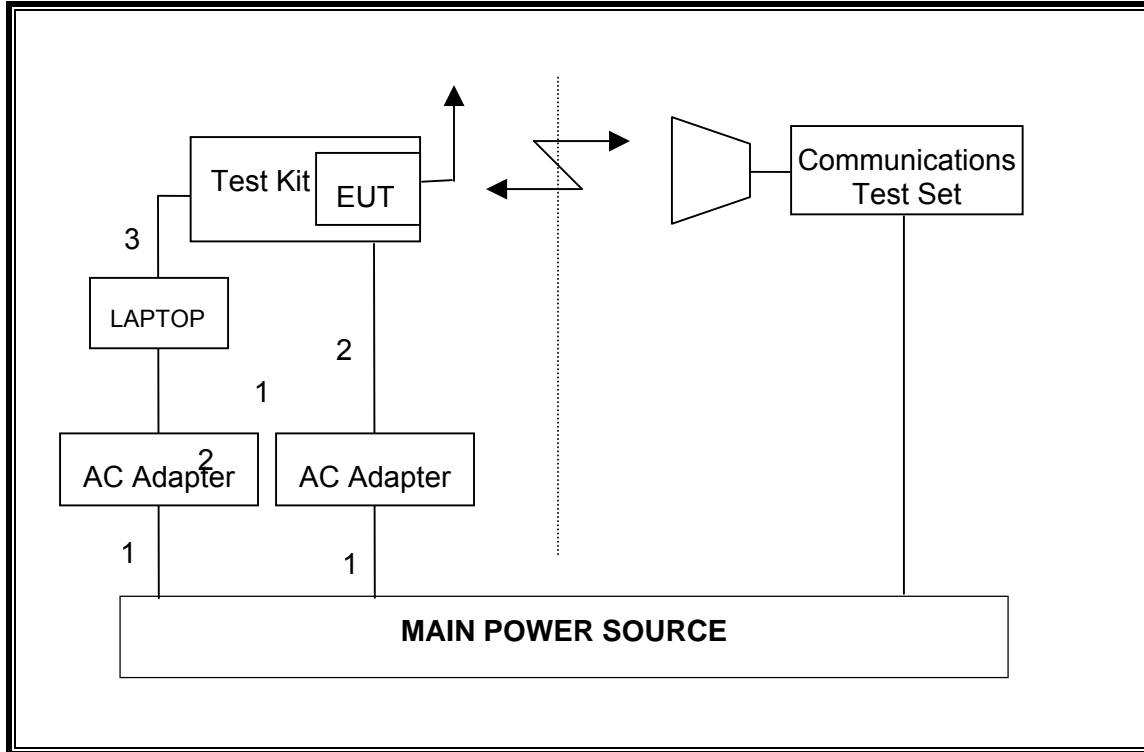
TEST SETUP

The EUT is attached to the test board that is connected to an AC Adapter and Laptop during the test. A wireless link was established between the EUT and the 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 Due |
| Spectrum Analyzer, 26.5 GHz | Agilent / HP | E4440A | C01179 | 08/18/11 |
| Spectrum Analyzer, 26.5 GHz | Agilent / HP | E4440A | C01178 | 08/30/11 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | E4446A | C00986 | 05/05/11 |
| Spectrum Analyzer, 44 GHz | Agilent / HP | E4446A | C00996 | 10/29/11 |
| EMI Test Receiver, 30 MHz | R & S | ESHS 20 | N02396 | 05/06/11 |
| Preamplifier, 26.5 GHz | Agilent / HP | 8449B | C01052 | 07/14/11 |
| Preamplifier, 26.5 GHz | Agilent / HP | 8449B | C01063 | 07/15/11 |
| Preamplifier, 1300 MHz | Agilent / HP | 8447D | C00885 | 01/06/11 |
| Antenna, Horn, 18 GHz | EMCO | 3115 | C00783 | 06/29/11 |
| Antenna, Horn, 18 GHz | EMCO | 3115 | C00943 | CNR |
| Antenna, Horn, 18 GHz | EMCO | 3115 | C00945 | 07/01/11 |
| Antenna, Bilog, 2 GHz | Sunol Sciences | JB1 | C01011 | 07/12/11 |
| Antenna, Bilog, 2 GHz | Sunol Sciences | JB1 | C01016 | 07/13/11 |
| LISN, 10 kHz ~ 30 MHz | Solar | 8012-50-R-24-BNC | N02481 | 11/05/11 |
| LISN, 30 MHz | FCC | LISN-50/250-25-2 | N02625 | 11/06/11 |
| Directional Coupler, 18 GHz | Krytar | 1817 | N02656 | CNR |
| DC power supply, 60 V @ 18 A | Agilent / HP | 6296A | N/A | CNR |
| Communications Test Set | Agilent / HP | E5515C | C01086 | 06/17/11 |
| Peak Power Meter | Boonton | 4541 | C01189 | 02/26/11 |
| Peak Power Sensor | Boonton | 57006 | C01203 | 02/24/11 |
| Temperature / Humidity Chamber | Thermotron | SE 600-10-10 | C00930 | 04/11/11 |
| Highpass Filter, 2.7 GHz | Micro-Tronics | HPM13194 | N02687 | CNR |
| Highpass Filter, 1.5 GHz | Micro-Tronics | HPM13193 | N02688 | CNR |
| Signal Generator, 20 GHz | Agilent / HP | 83732B | C00774 | 07/14/12 |
| Antenna, Tuned Dipole 400~1000 | ETS | 3121C DB4 | C00993 | 07/10/11 |

7. OUTPUT POWER VERIFICATION

Maximum output power is verified on the Low, Middle and High channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E for 1xRTT, section 3.1.2.3.4 of 3GPP2 C.S0033-0/TIA-866 for Rel. 0 and section 4.3.4 of 3GPP2 C.S0033-A for Rev. A

7.1. CDMA2000 1xRTT

This procedure assumes the Agilent 8960 Test Set has the following applications installed and with valid license.

| | |
|----------------------|---------------------|
| <u>Application</u> | <u>Rev, License</u> |
| CDMA2000 Mobile Test | B.13.08, L |

- 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 or details
- Traffic Data Rate > Full
- TDSO SCH Info > F-SCH Parameters > F-SCH Data Rate > 153.6 kbps
 > R-SCH Parameters > R-SCH Data Rate > 153.6 kbps
- Rvs Power Ctrl > All Up bits (Maximum TxPout)

RF Output Power for Cellular Band

| Radio Configuration (RC) | Service Option (SO) | Conducted Output Power (dBm) | | |
|--------------------------|---------------------|------------------------------|----------------------|----------------------|
| | | Ch. 1013 / 824.7 MHz | Ch. 384 / 836.52 MHz | Ch. 777 / 848.31 MHz |
| | | Peak | Peak | Peak |
| RC1 | 2 (Loopback) | 29.68 | 29.53 | 29.81 |
| | 55 (Loopback) | 29.71 | 29.64 | 29.96 |
| RC2 | 9 (Loopback) | 29.71 | 29.66 | 29.91 |
| | 55 (Loopback) | 29.50 | 29.54 | 29.89 |
| RC3 | 2 (Loopback) | 29.26 | 29.03 | 29.62 |
| | 55 (Loopback) | 29.21 | 29.14 | 29.63 |
| | 32 (+ F-SCH) | 29.40 | 29.10 | 29.54 |
| | 32 (+ SCH) | 29.43 | 29.15 | 29.52 |
| RC4 | 2 (Loopback) | 29.27 | 29.19 | 29.54 |
| | 55 (Loopback) | 29.27 | 29.11 | 29.62 |
| | 32 (+ F-SCH) | 29.31 | 29.11 | 29.52 |
| | 32 (+ SCH) | 29.27 | 29.05 | 29.46 |
| RC5 | 9 (Loopback) | 29.23 | 29.10 | 29.51 |
| | 55 (Loopback) | 29.29 | 29.21 | 29.60 |

RF Output Power for PCS Band

| Radio Configuration (RC) | Service Option (SO) | Conducted Output Power (dBm) | | |
|--------------------------|---------------------|------------------------------|--------------------|------------------------|
| | | Ch. 25 / 1851.25 MHz | Ch. 600 / 1880 MHz | Ch. 1175 / 1908.75 MHz |
| | | Peak | Peak | Peak |
| RC1 | 2 (Loopback) | 29.62 | 30.09 | 28.87 |
| | 55 (Loopback) | 29.67 | 30.02 | 28.81 |
| RC2 | 9 (Loopback) | 29.72 | 30.26 | 29.21 |
| | 55 (Loopback) | 29.70 | 30.29 | 29.20 |
| RC3 | 2 (Loopback) | 29.06 | 29.18 | 28.68 |
| | 55 (Loopback) | 29.23 | 29.69 | 28.69 |
| | 32 (+ F-SCH) | 29.09 | 29.81 | 28.70 |
| | 32 (+ SCH) | 29.04 | 29.79 | 28.37 |
| RC4 | 2 (Loopback) | 29.46 | 29.91 | 28.67 |
| | 55 (Loopback) | 29.41 | 29.91 | 28.39 |
| | 32 (+ F-SCH) | 29.35 | 29.89 | 28.67 |
| | 32 (+ SCH) | 29.32 | 29.90 | 28.65 |
| RC5 | 9 (Loopback) | 29.50 | 29.88 | 28.68 |
| | 55 (Loopback) | 29.49 | 29.90 | 28.75 |

8. CONDUCTED TEST RESULTS

8.1. OCCUPIED BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the -26 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal -26 dB bandwidth function is utilized.

RESULTS

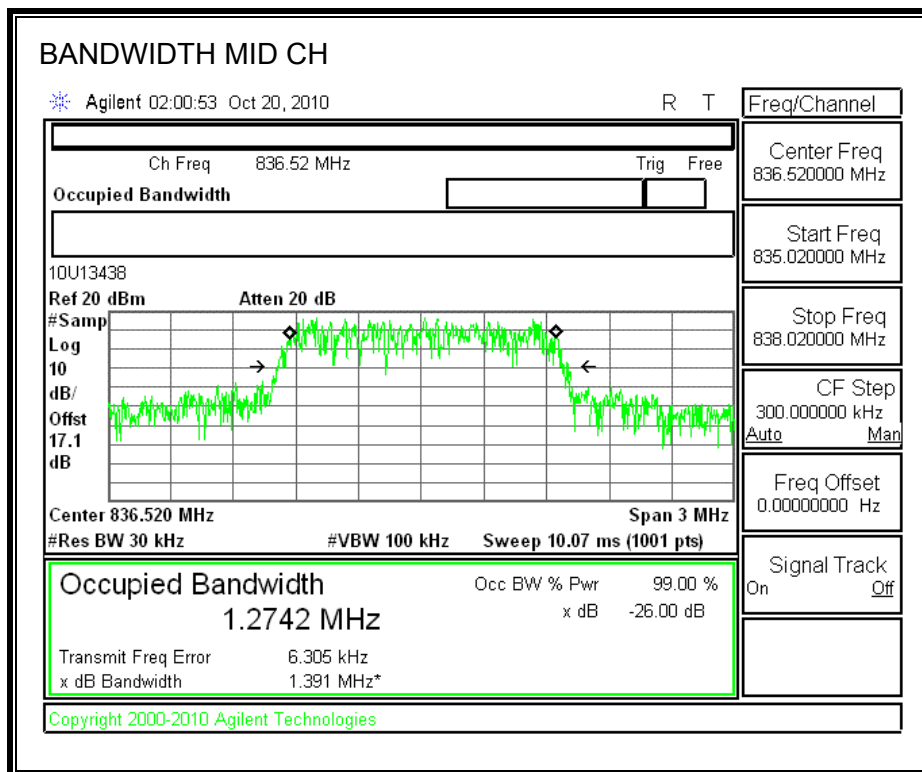
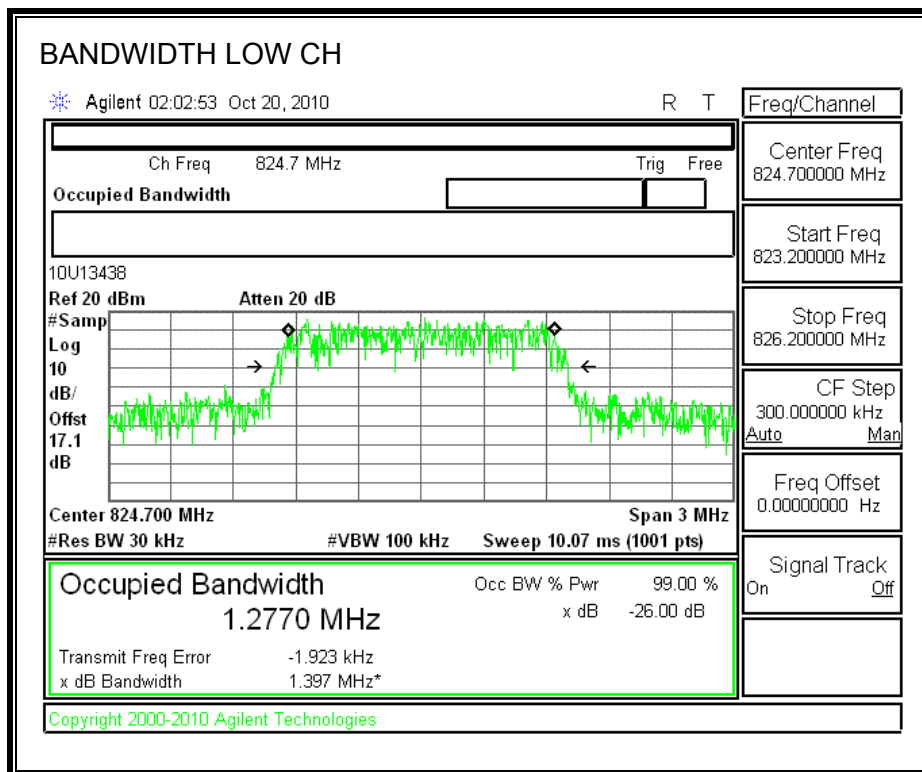
CELL, 1xRTT Modulation

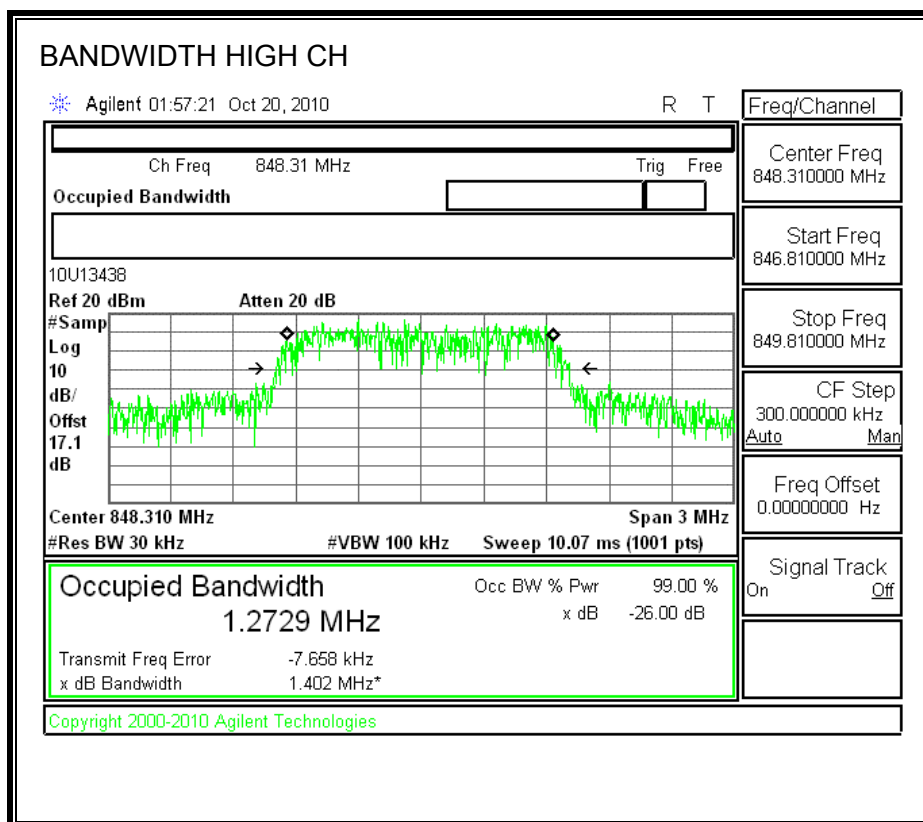
| Channel | Frequency (MHz) | 99% BW (MHz) | -26dB BW (MHz) |
|---------|-----------------|--------------|----------------|
| Low | 824.70 | 1.277 | 1.397 |
| Middle | 836.52 | 1.274 | 1.391 |
| High | 848.31 | 1.273 | 1.402 |

PCS, 1xRTT Modulation

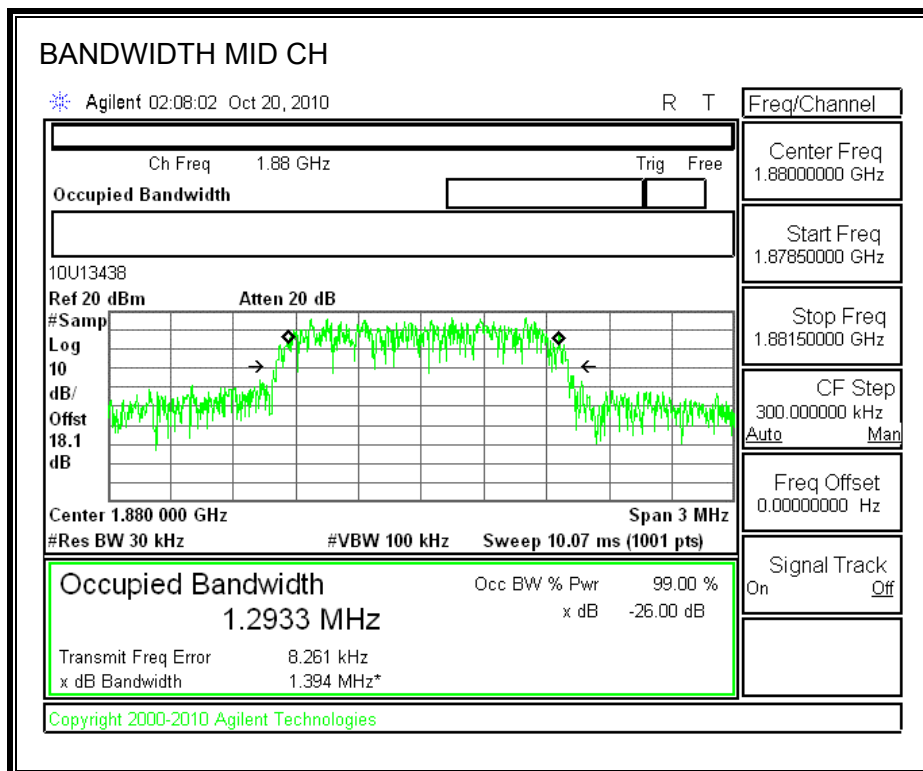
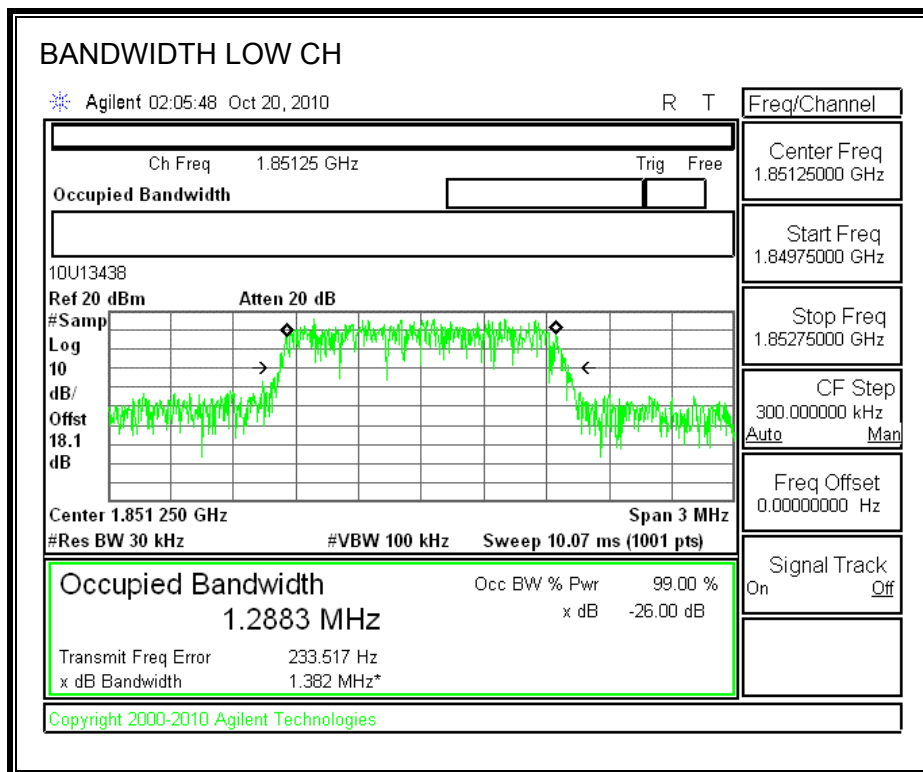
| Channel | Frequency (MHz) | 99% BW (MHz) | -26dB BW (MHz) |
|---------|-----------------|--------------|----------------|
| Low | 1851.25 | 1.288 | 1.382 |
| Middle | 1880.00 | 1.293 | 1.394 |
| High | 1908.75 | 1.291 | 1.366 |

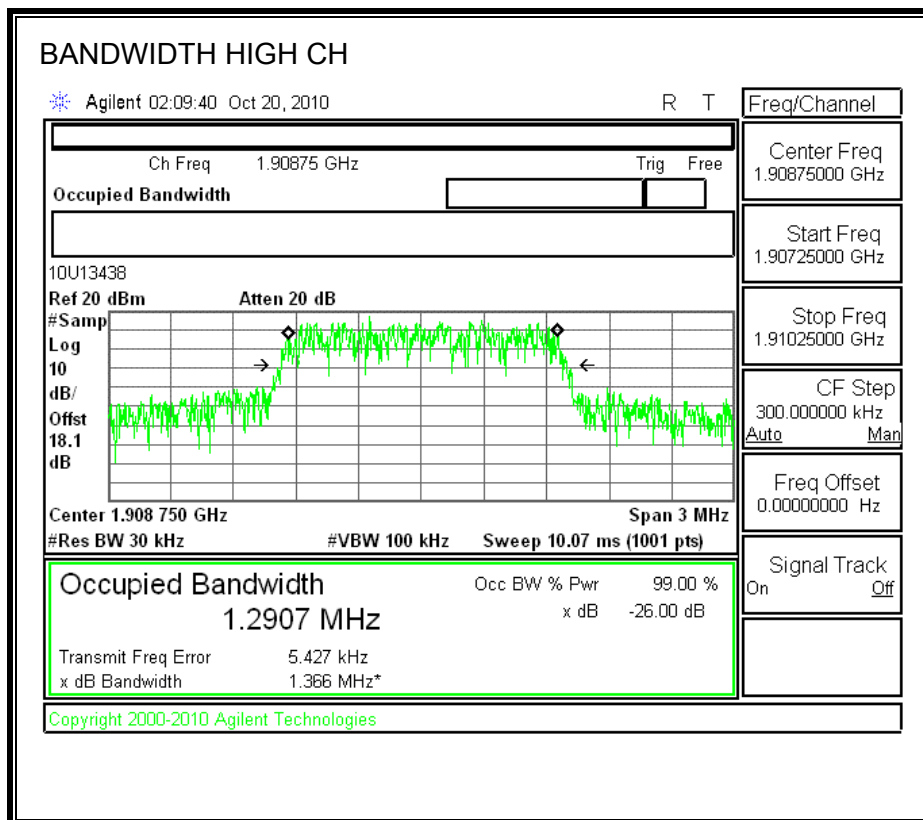
CELL, 1xRTT MODULATION





PCS, 1xRTT MODULATION





8.2. RF POWER OUTPUT

LIMIT

22.913(a) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(b) & RSS133 § 6.4 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.

RSS-132 § 4.4 The maximum ERP shall be 6.3 Watts for mobile stations.

TEST PROCEDURE

RSS-132, RSS-133, & ANSI / TIA / EIA 603C Clause 2.2.17

RESULTS

CELL, 1xRTT Modulation

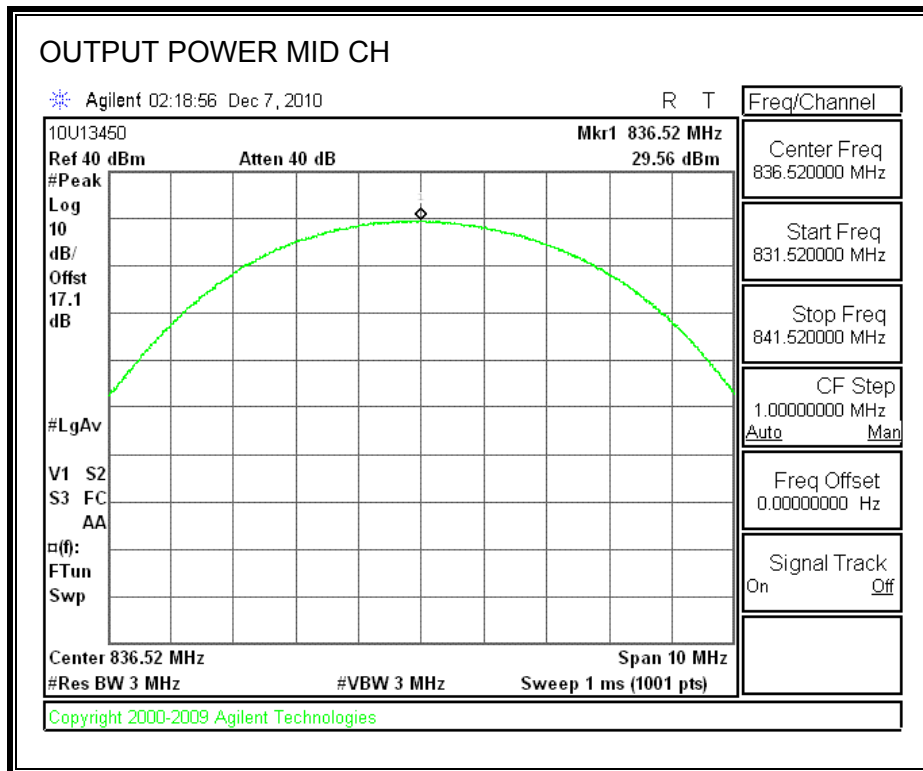
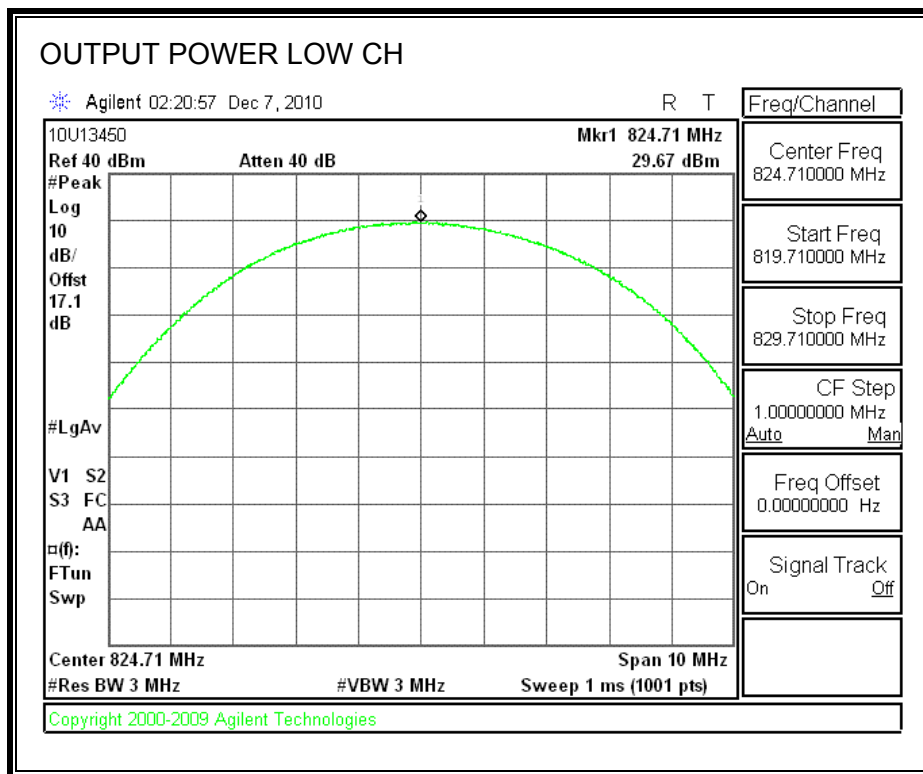
| Channel | Frequency (MHz) | Conducted Peak Power (dBm) | Conducted Peak Power (mW) | Conducted Avg Power (dBm) | Conducted Avg Power (mW) |
|---------|--------------------|----------------------------------|---------------------------------|---------------------------------|--------------------------------|
| Low | 824.70 | 29.67 | 926.83 | 24.29 | 268.53 |
| Middle | 836.52 | 29.56 | 903.65 | 24.32 | 270.40 |
| High | 848.31 | 29.75 | 944.06 | 24.35 | 272.27 |

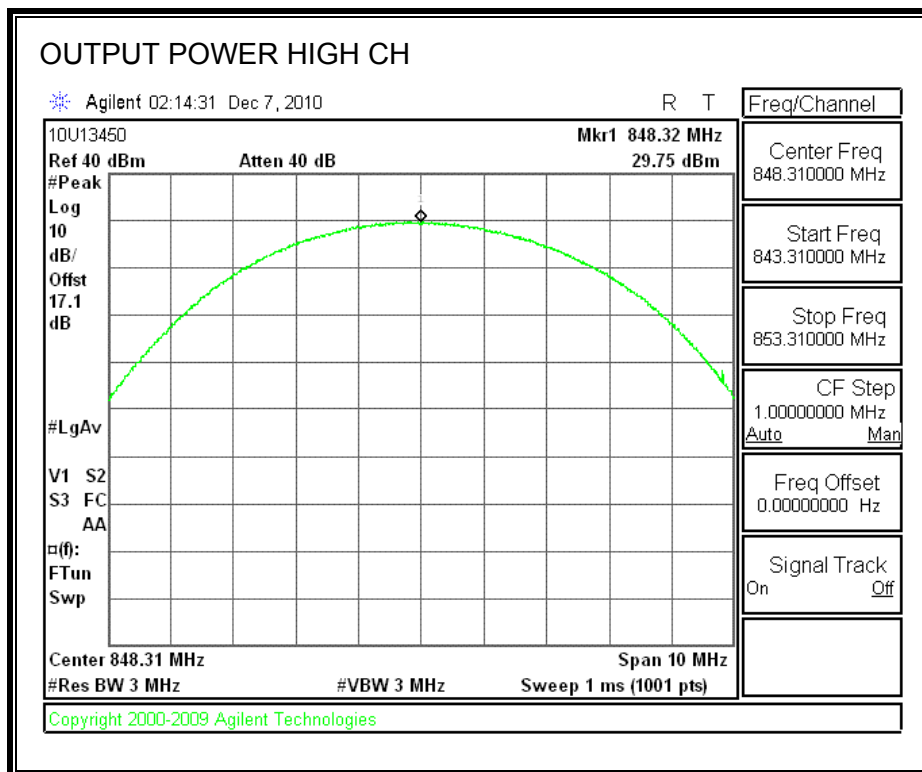
PCS, 1xRTT Modulation

| Channel | Frequency (MHz) | Conducted Peak Power (dBm) | Conducted Peak Power (mW) | Conducted Avg Power (dBm) | Conducted Avg Power (mW) |
|---------|--------------------|----------------------------------|---------------------------------|---------------------------------|--------------------------------|
| Low | 1851.25 | 29.70 | 933.25 | 24.69 | 294.44 |
| Middle | 1880.00 | 29.58 | 907.82 | 24.56 | 285.76 |
| High | 1908.75 | 29.01 | 796.16 | 24.28 | 267.92 |

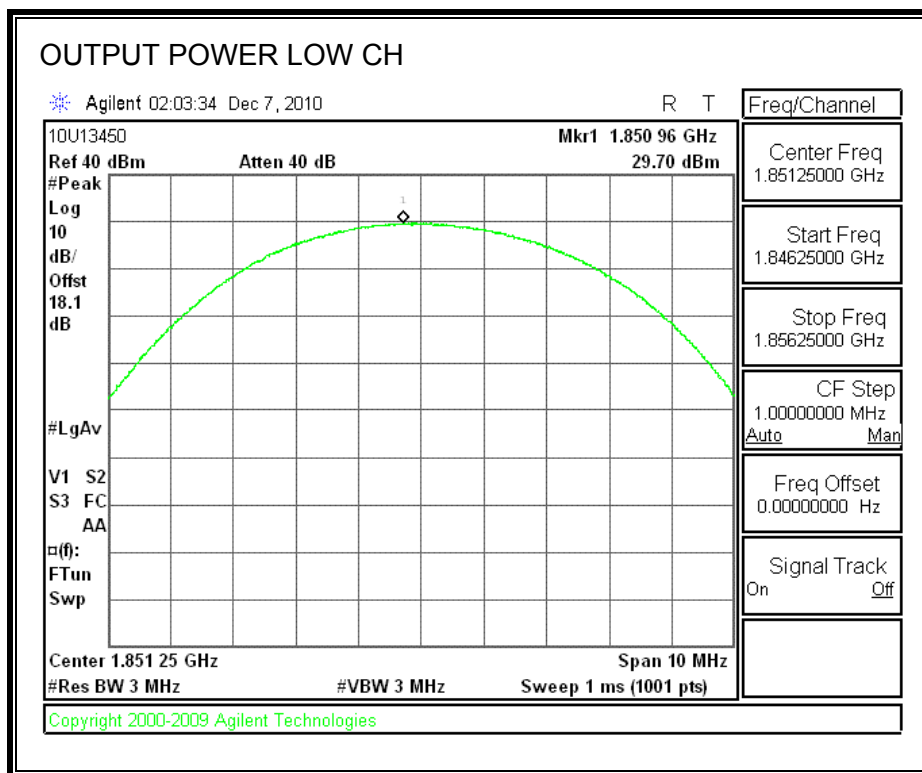
NOTE: RBW=VBW=3MHz

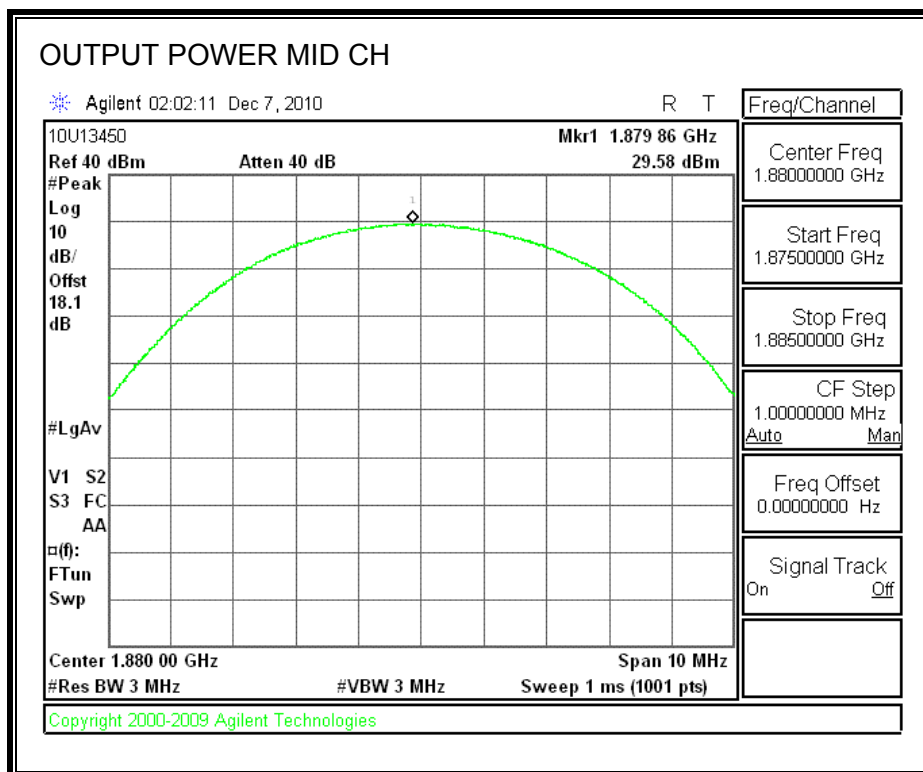
CELL PEAK POWER, 1xRTT MODULATION

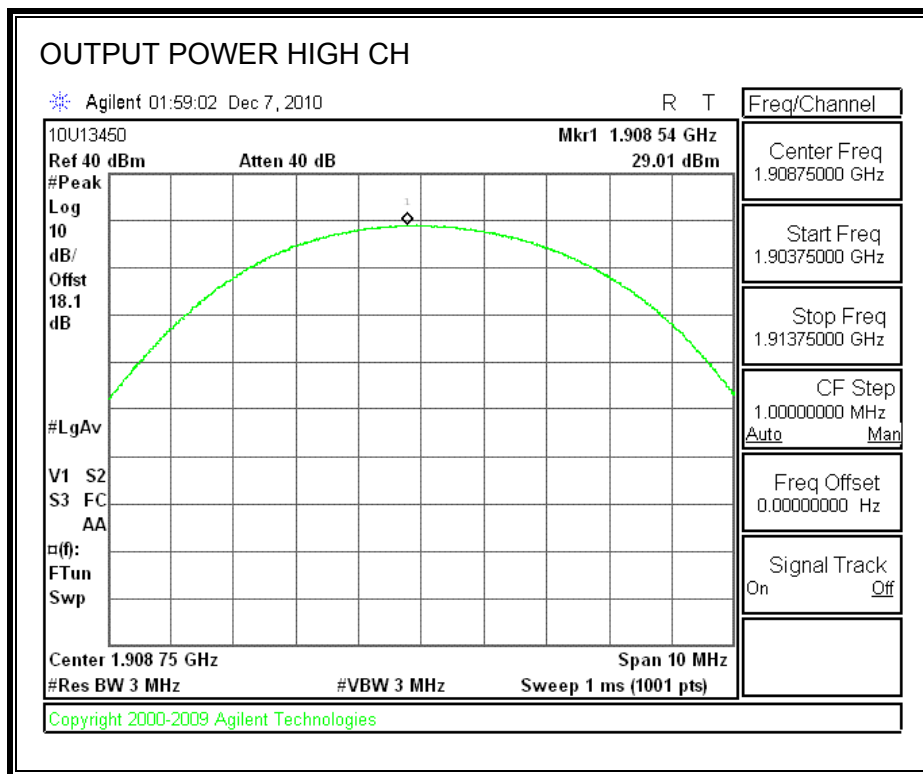




PCS PEAK POWER, 1xRTT MODULATION







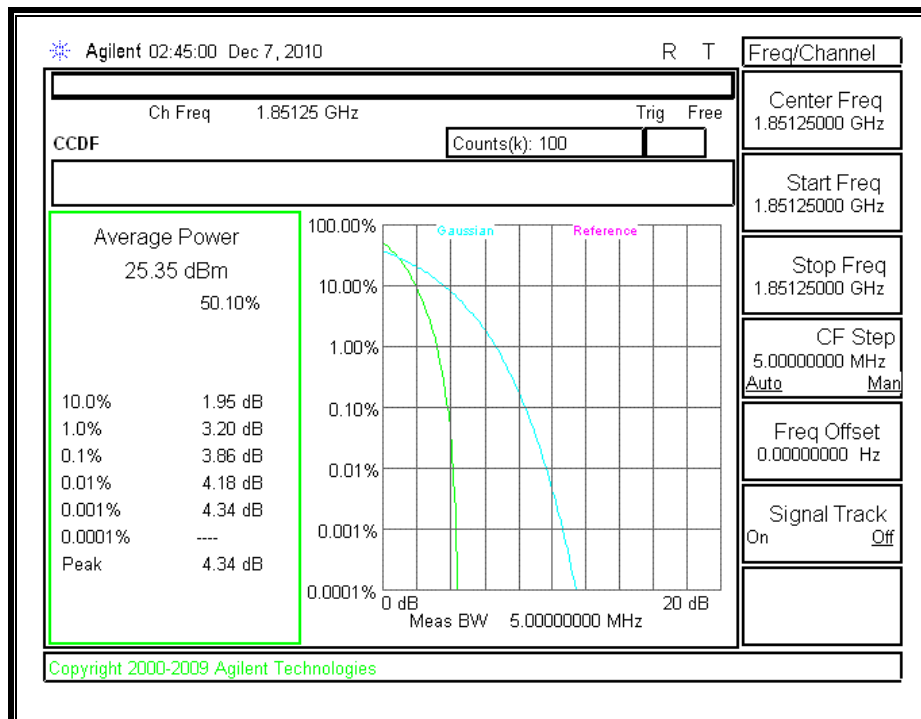
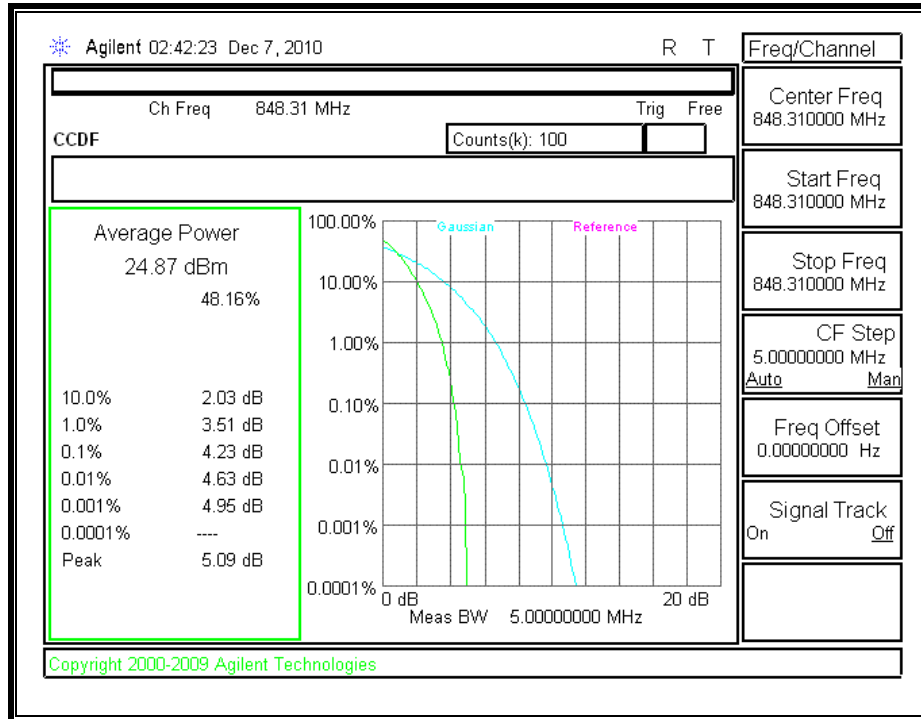
Peak-To-Average Ratio:

Offset: 1.1 (cable) + 16 (pad) = 17.1 dB For Cell Band

2.1 (cable) + 16 (pad) = 18.1 dB For PCS Band

| Mode | Channel Band-width (MHZ) | Ch. No. | f (MHz) | Conducted Power (dBm) | | Peak-to-Average Ratio (PAR) |
|---|--------------------------|---------|---------|-----------------------|---------|-----------------------------|
| | | | | *Peak | Average | |
| 1xRTT | 1.277 | 777 | 848.31 | 29.75 | 24.35 | 5.09 |
| 1xRTT | 1.293 | 25 | 1851.25 | 29.7 | 24.69 | 4.34 |
| | | | | | | |
| *Peak Reading = Average Reading + Peak-to-Average Ratio | | | | | | |
| | | | | | | |

5MHz QPSK



8.3. SPURIOUS EMISSION AT ANTENNA TERMINAL

LIMIT

§22.917 (e) and §24.238 (a), 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

ANSI / TIA / EIA 603 Clause 3.2.13 & FCC 22.917 (h)

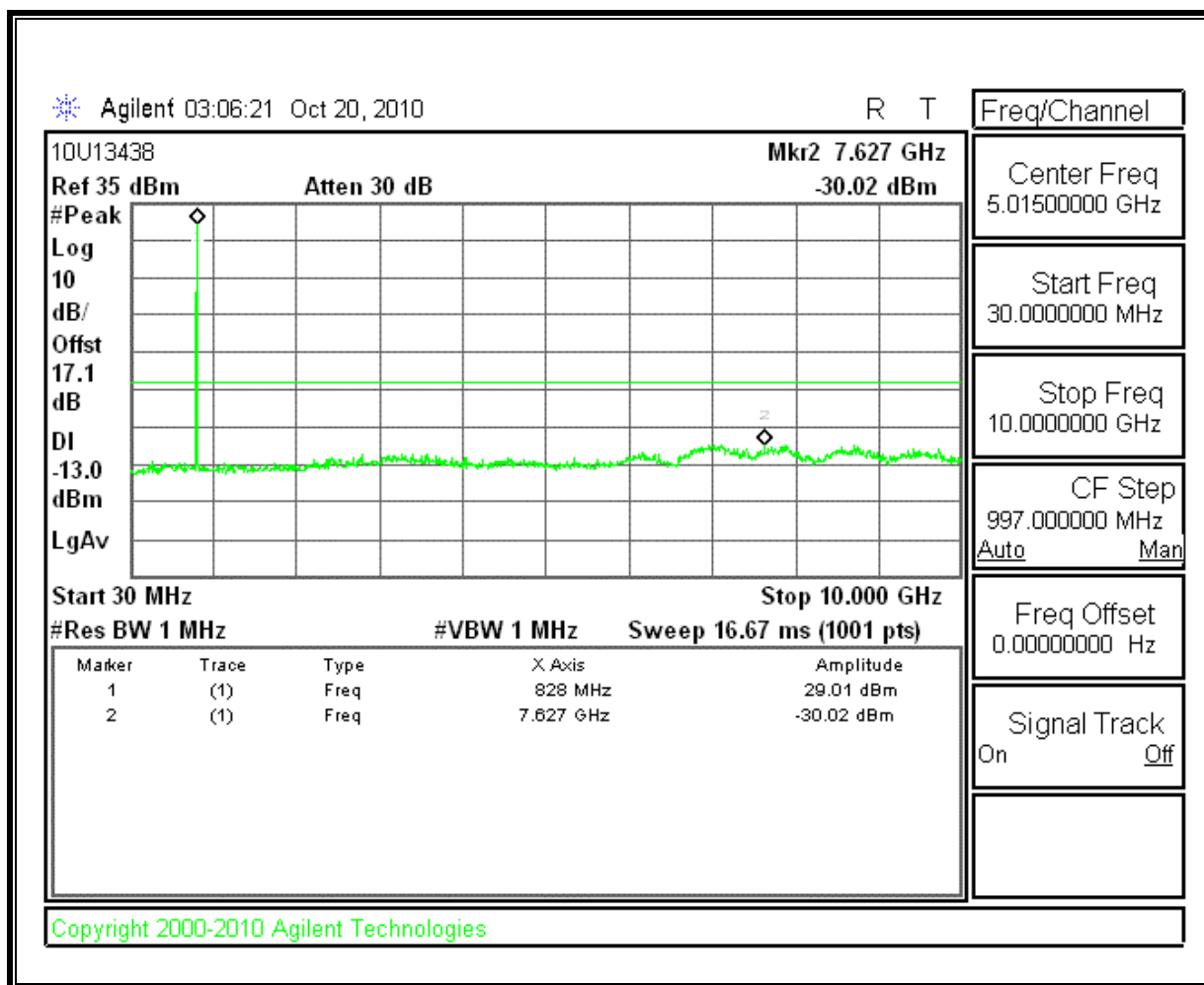
MODES TESTED

- CDMA – 1xRTT.

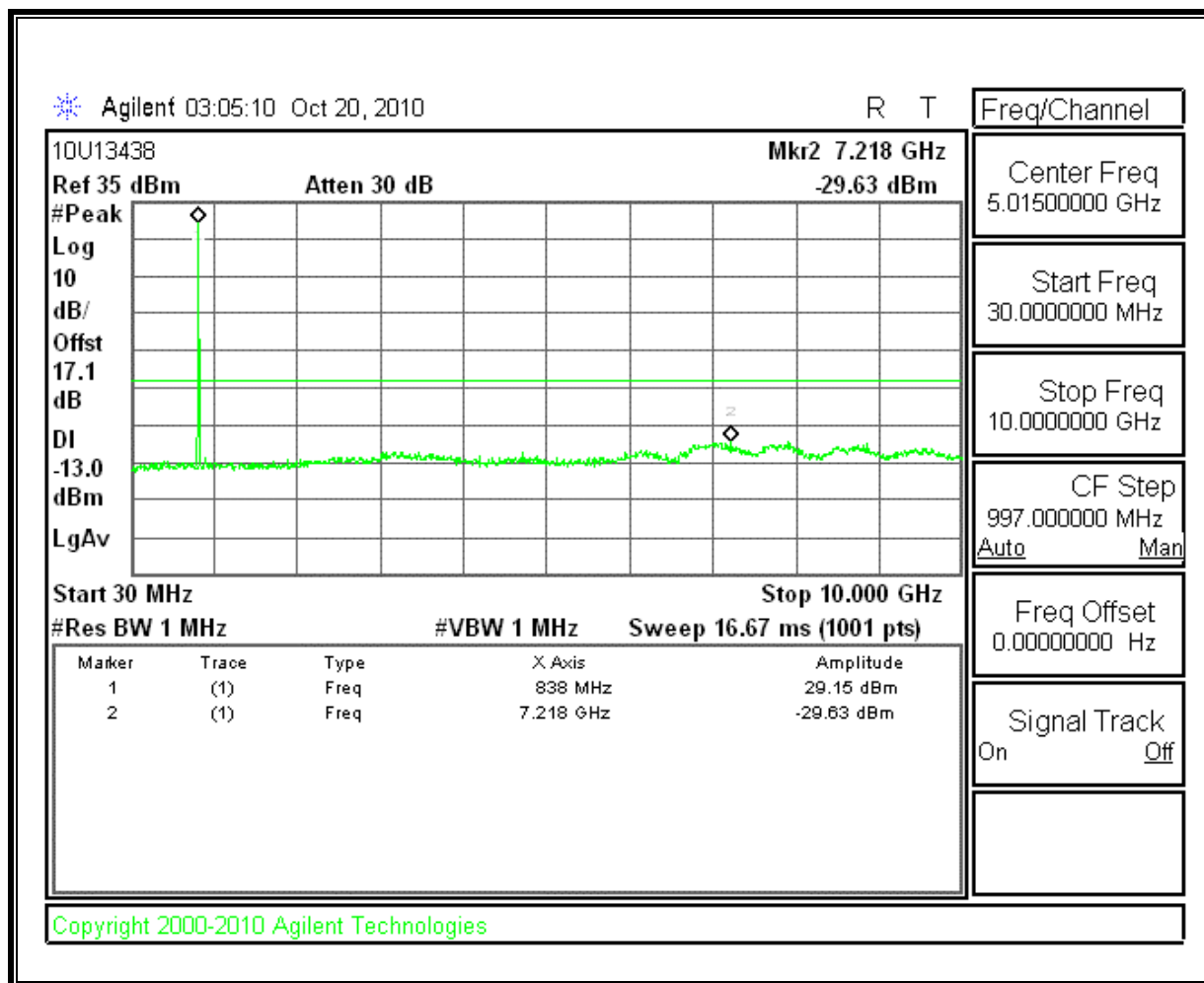
RESULTS

CELL, 1xRTT MODULATION:

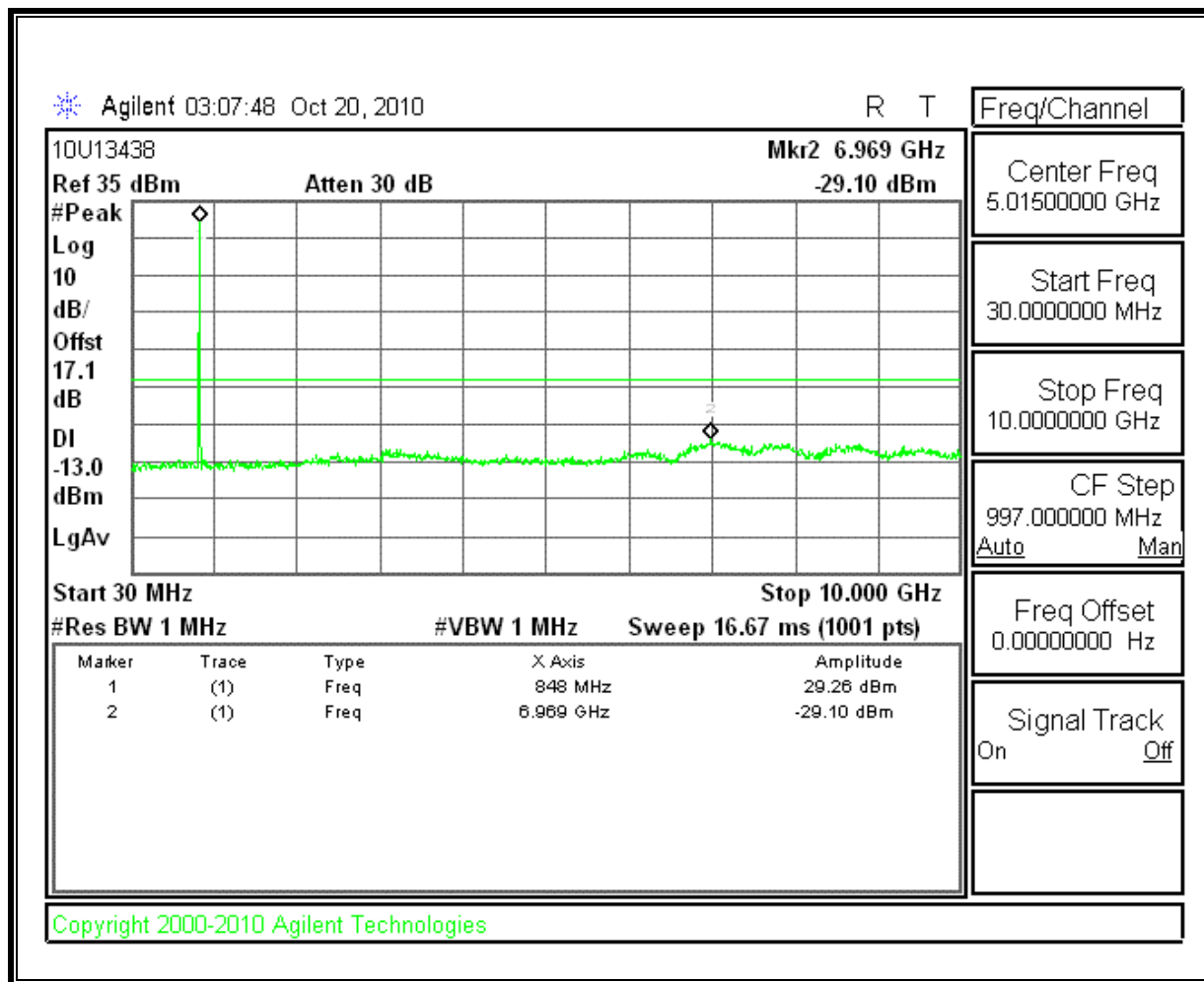
Low Channel, Out-Of-Band Emissions



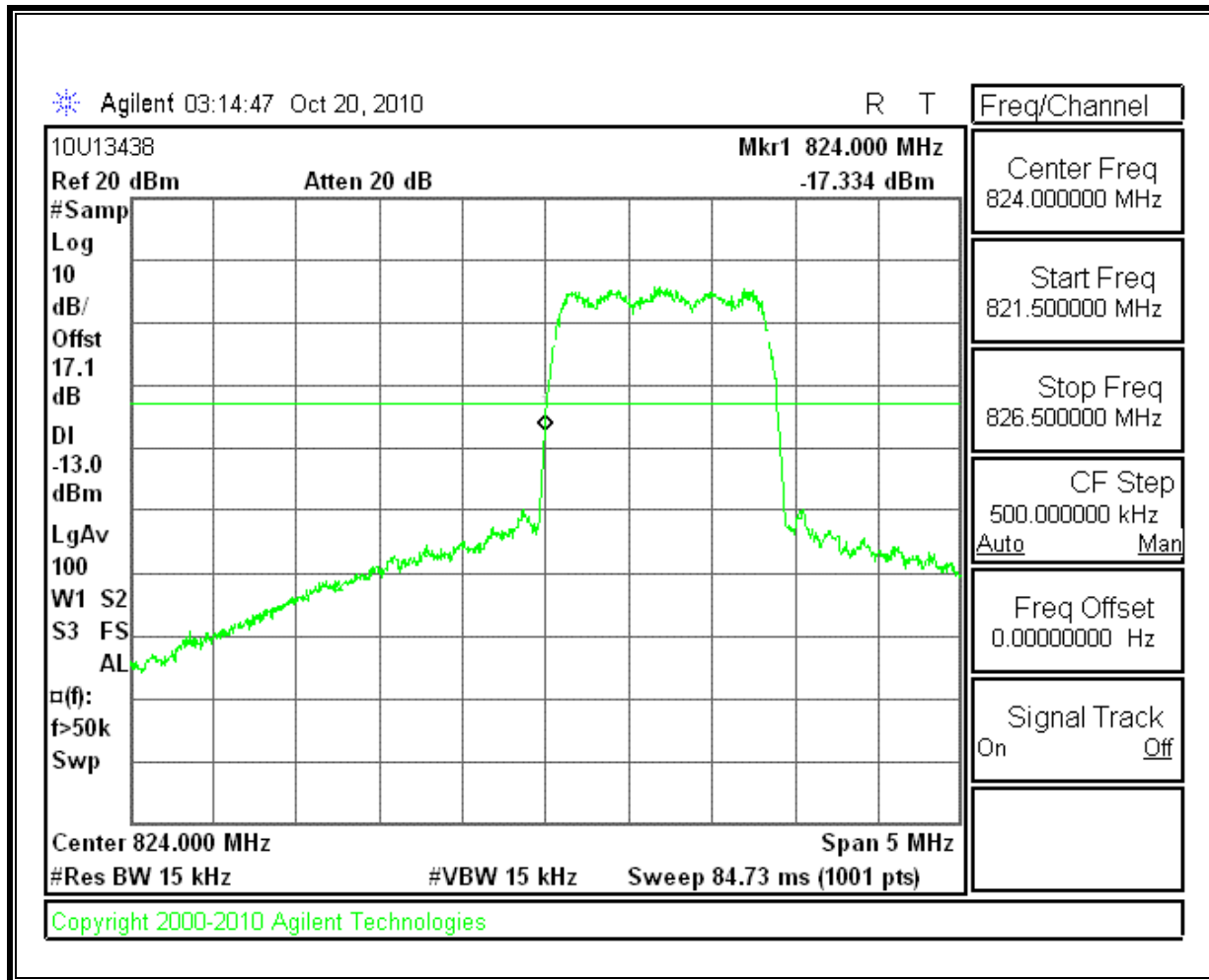
Mid Channel, Out-Of-Band Emissions



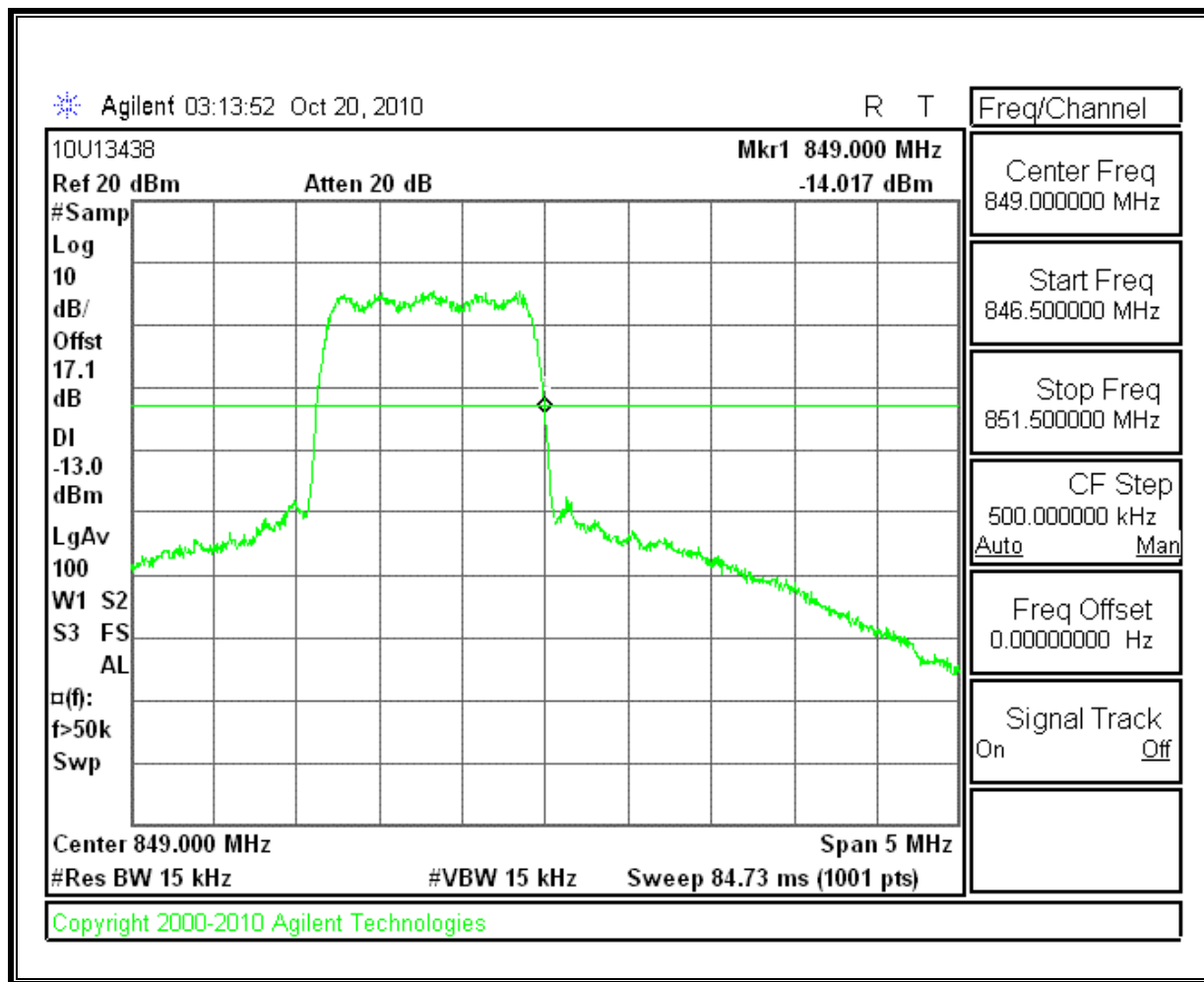
High Channel, Out-Of-Band Emissions



Low Channel Band Edge

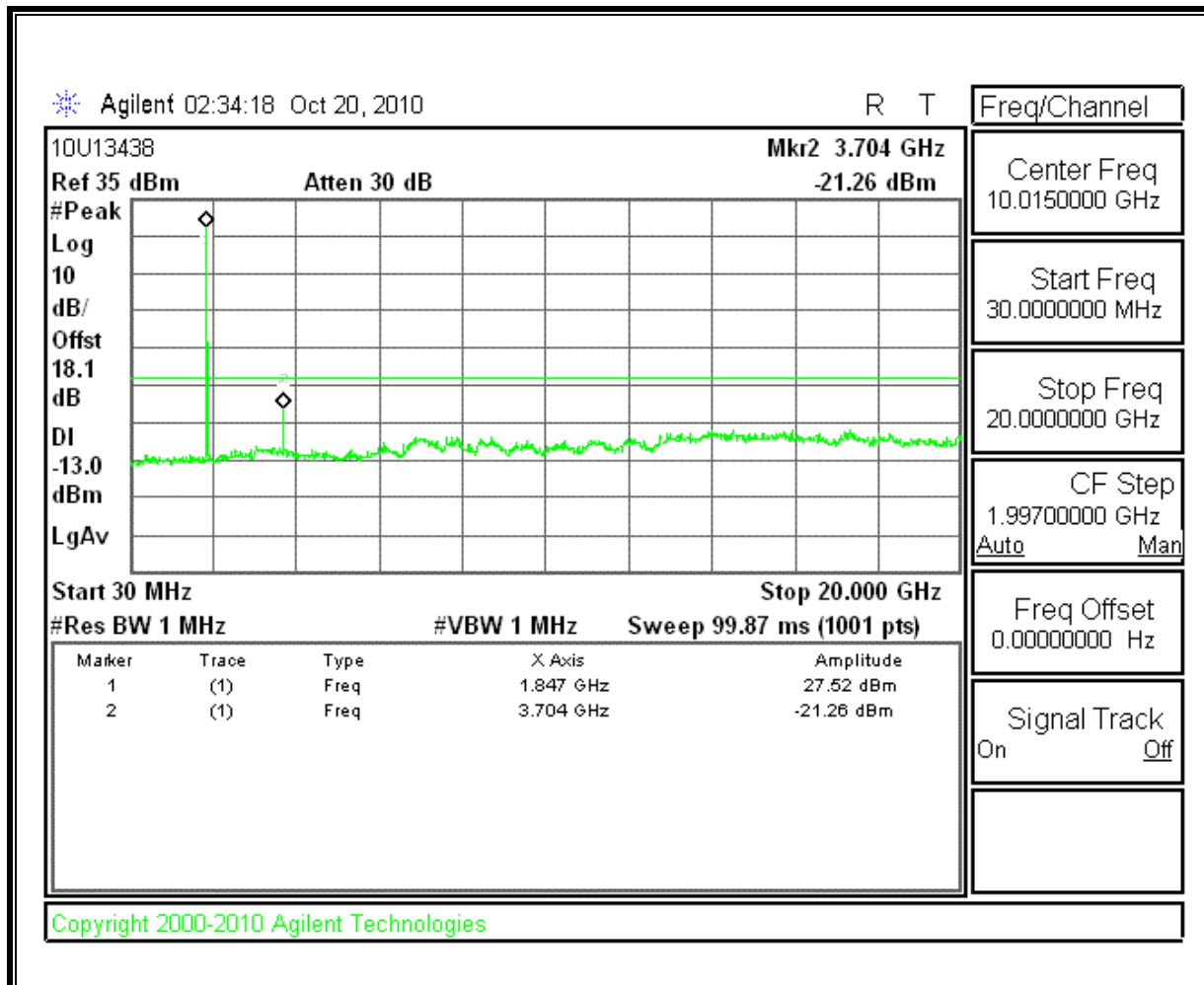


High Channel Band Edge

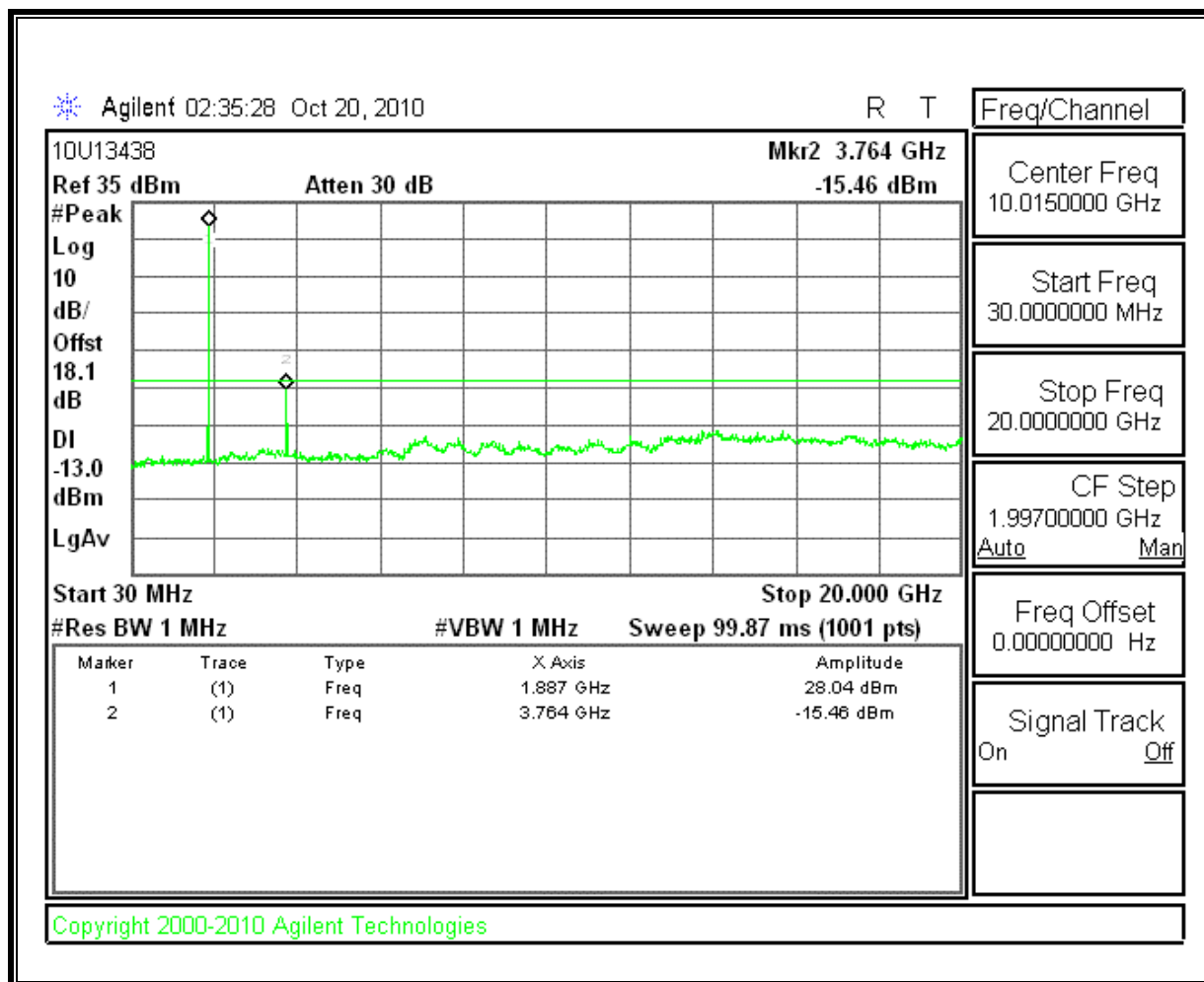


PCS 1xRTT MODULATION RESULTS

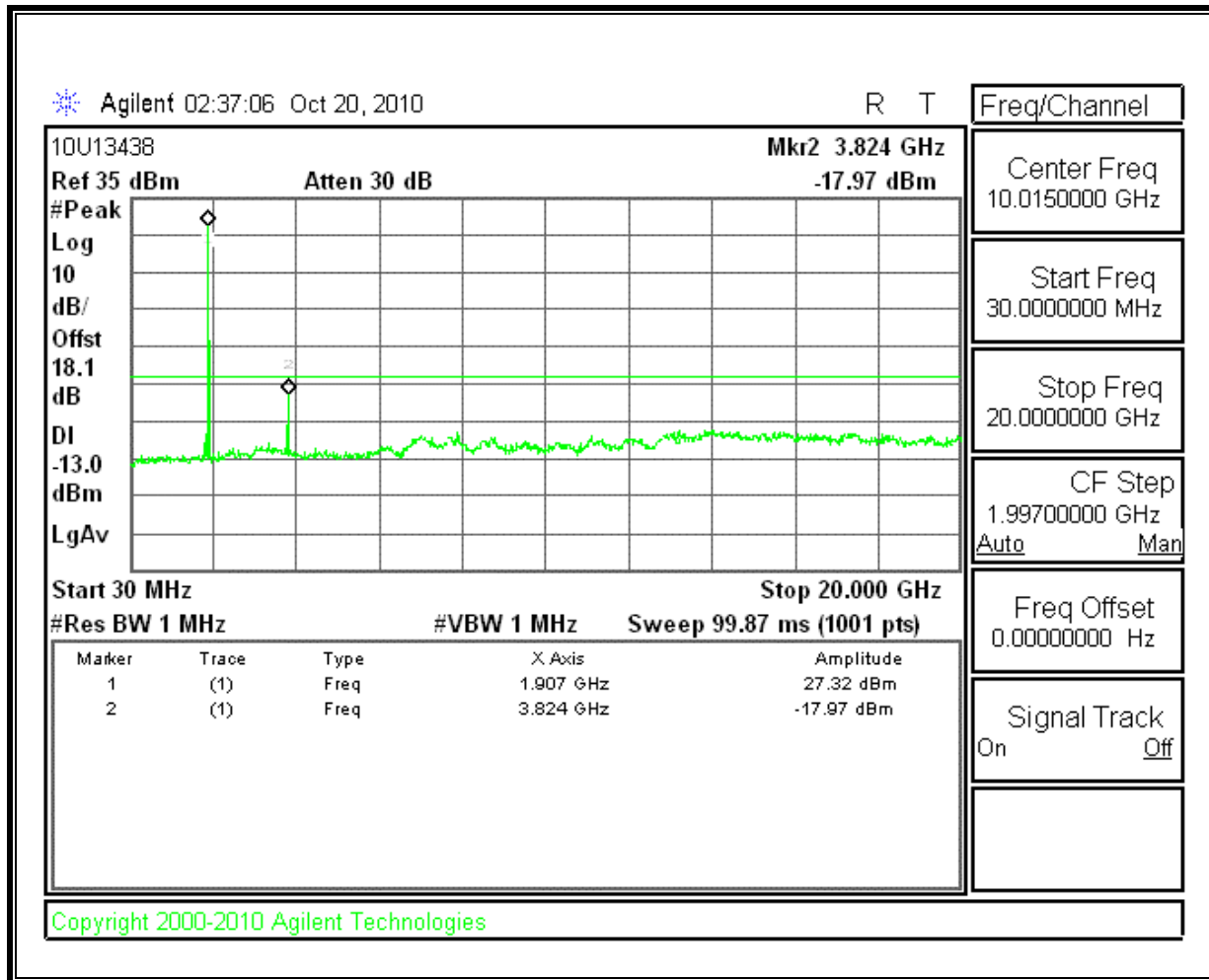
Low Channel, Out-Of-Band Emissions



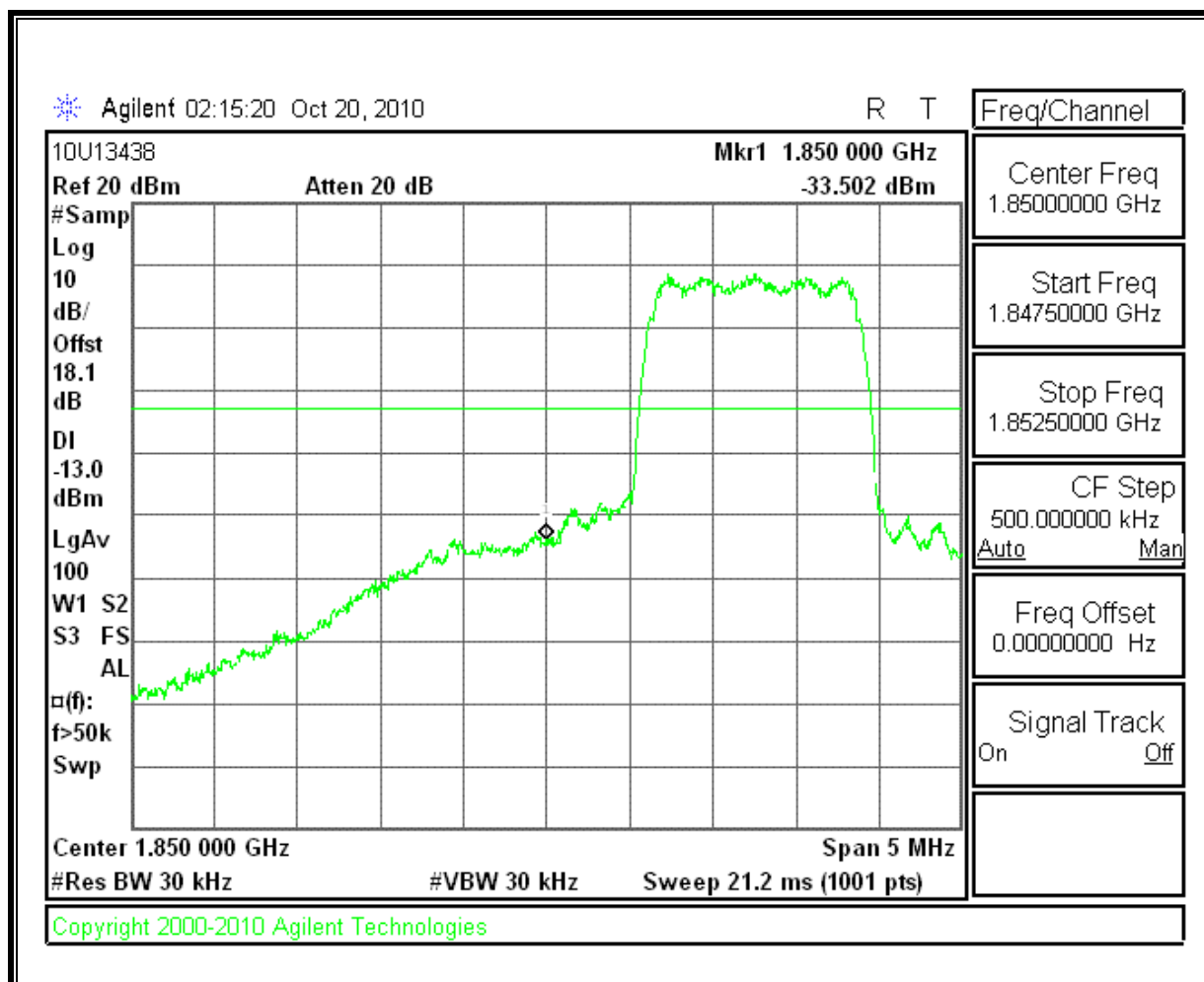
Mid Channel, Out-Of-Band Emissions



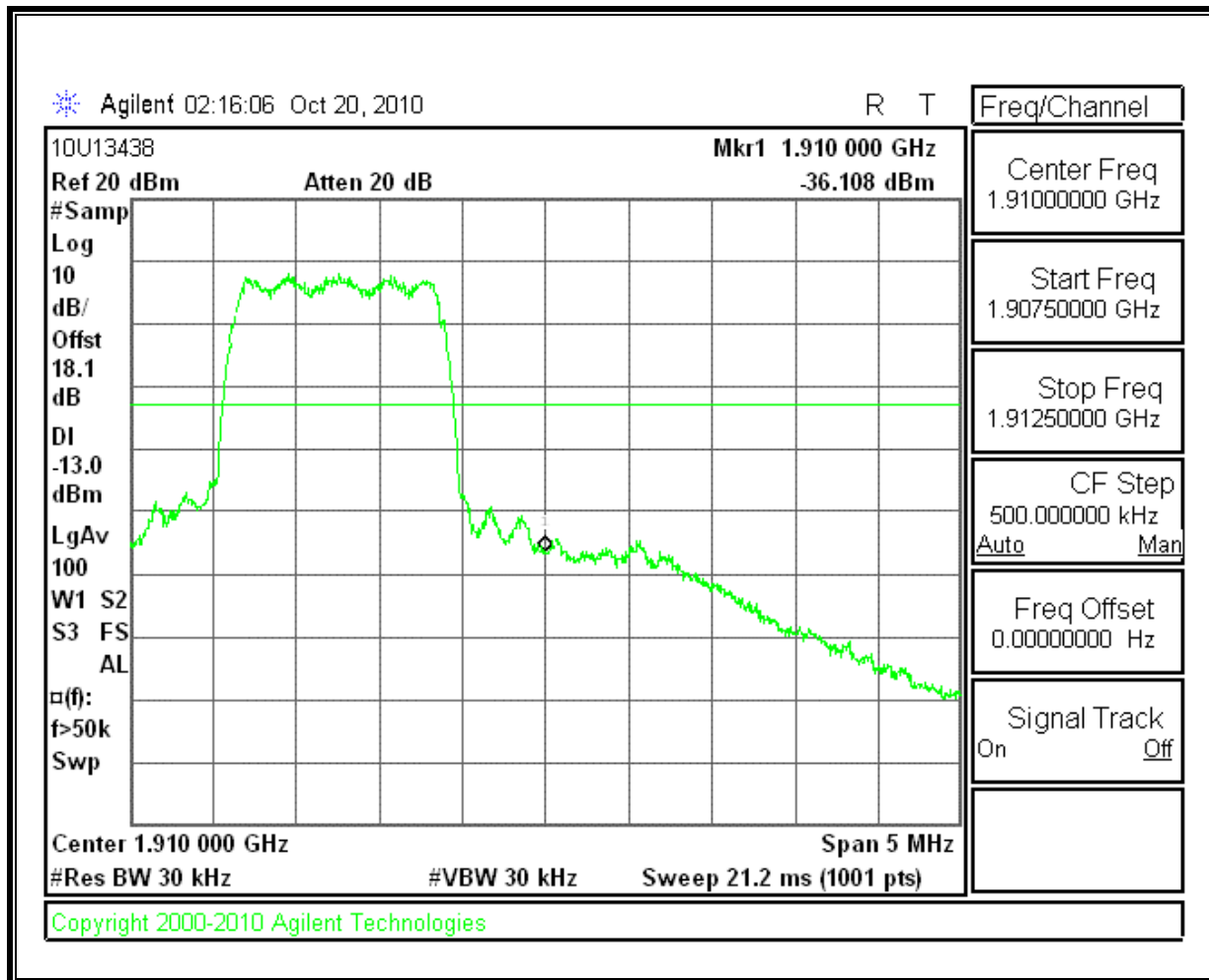
High Channel, Out-Of-Band Emissions



Low Channel Band Edge



High Channel Band Edge



8.4. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235

LIMITS

- §22.355 & RSS-132 4.3 - The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations.
- §24.235 - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

TEST PROCEDURE

- Temp. = -20° to $+50^{\circ}\text{C}$
- Voltage = 115 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 $+50^{\circ}\text{C}$ is reached.

Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

MODES TESTED

- CDMA – 1xRTT

RESULTS

See the following pages.

CELL – MID CHANNEL

| Reference Frequency: Cellular Mid Channel 836.520056MHz @ 20°C | | | | |
|--|------------------------------|---|-------------|-------------|
| Limit: to stay +- 2.5 ppm = 2091.300 Hz | | | | |
| DC Power Supply (Vac) | Environment Temperature (°C) | Frequency Deviation Measured with Time Elapse | | |
| | | (MHz) | Delta (ppm) | Limit (ppm) |
| 115.00 | 50 | 836.520120 | -0.077 | 2.5 |
| 115.00 | 40 | 836.520086 | -0.036 | 2.5 |
| 115.00 | 30 | 836.519677 | 0.453 | 2.5 |
| 115.00 | 20 | 836.520056 | 0 | 2.5 |
| 115.00 | 10 | 836.520093 | -0.044 | 2.5 |
| 115.00 | 0 | 836.520106 | -0.060 | 2.5 |
| 115.00 | -10 | 836.520110 | -0.065 | 2.5 |
| 115.00 | -20 | 836.520136 | -0.096 | 2.5 |
| <hr/> | | | | |
| 97.75 | 20 | 836.520026 | 0.036 | 2.5 |
| 132.25 | 20 | 836.52002 | 0.043 | 2.5 |

PCS – MID CHANNEL

| Reference Frequency: PCS Mid Channel 1880.000098 @ 20°C | | | | |
|---|------------------------------|---|-------------|-------------|
| Limit: within the authorized block or +/- 2.5 ppm = 4700.000 Hz | | | | |
| Power Supply (Vac) | Environment Temperature (°C) | Frequency Deviation Measured with Time Elapse | | |
| | | (MHz) | Delta (ppm) | Limit (ppm) |
| 115.00 | 50 | 1880.000153 | -0.029 | 2.5 |
| 115.00 | 40 | 1880.000028 | 0.037 | 2.5 |
| 115.00 | 30 | 1880.000076 | 0.012 | 2.5 |
| 115.00 | 20 | 1880.000098 | 0 | 2.5 |
| 115.00 | 10 | 1880.000216 | -0.063 | 2.5 |
| 115.00 | 0 | 1880.000334 | -0.126 | 2.5 |
| 115.00 | -10 | 1880.000088 | 0.005 | 2.5 |
| 115.00 | -20 | 1880.000227 | -0.069 | 2.5 |
| | | | | |
| 97.75 | 20 | 1880.000094 | 0.002 | 2.5 |
| 132.25 | 20 | 1880.000015 | 0.044 | 2.5 |

9. RADIATED TEST RESULTS

9.1. RADIATED POWER (ERP & EIRP)

LIMIT

22.913(a) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(b) & RSS133 § 6.4 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.

RSS-132 § 4.4 The maximum ERP shall be 6.3 Watts for mobile stations.

TEST PROCEDURE

RSS-132, RSS-133, & ANSI / TIA / EIA 603C Clause 2.2.17

MODES TESTED

- CDMA – 1xRTT

RESULTS for Cellular Band (ERP)

| Mode | Channel | f (MHz) | ERP(Standard Cover) | |
|-------|---------|---------|----------------------|--------|
| | | | dBm | mW |
| 1xRTT | 1013 | 824.70 | 28.90 | 776.25 |
| | 384 | 836.52 | 28.10 | 645.65 |
| | 777 | 848.31 | 27.60 | 575.44 |

RESULTS for PCS Band (EIRP)

| Mode | Channel | f (MHz) | EIRP(Standard Cover) | |
|-------|---------|---------|-----------------------|---------|
| | | | dBm | mW |
| 1xRTT | 512 | 1850.20 | 29.40 | 870.96 |
| | 661 | 1880.00 | 30.00 | 1000.00 |
| | 810 | 1909.80 | 29.70 | 933.25 |

CELL 1xRTT MODULATION

| High Frequency Substitution Measurement Compliance Certification Services Chamber A | | | | | | | |
|--|------------------------------|--------------------|--------------------|--------------|----------------|----------------|-------|
| Company: | SIERRA WIRELESS | | | | | | |
| Project #: | 10U13450 | | | | | | |
| Date: | 11/24/2010 | | | | | | |
| Test Engineer: | MENGISTU MEKURIA | | | | | | |
| Configuration: | EUT, FEXTURE JIG, AC ADAPTER | | | | | | |
| Mode: | TX, 1xRTT CELL BAND | | | | | | |
| Test Equipment: | | | | | | | |
| Receiving: Sunol T122, and 3m Chamber N-type Cable (Setup this one for testing EUT) | | | | | | | |
| Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse. | | | | | | | |
| f MHz | SA reading (dBm) | Ant. Pol. (H/V) | Path Loss (dBm) | ERP (dBm) | Limit (dBm) | Margin (dB) | Notes |
| 824.70 | -5.9 | V | 34.8 | 28.9 | 38.5 | -9.6 | |
| 824.70 | -9.5 | H | 30.5 | 21.0 | 38.5 | -17.4 | |
| 836.52 | -5.0 | V | 33.1 | 28.1 | 38.5 | -10.3 | |
| 836.52 | -11.1 | H | 31.2 | 20.0 | 38.5 | -18.4 | |
| 848.31 | -4.5 | V | 32.1 | 27.6 | 38.5 | -10.9 | |
| 848.31 | -10.8 | H | 31.2 | 20.4 | 38.5 | -18.1 | |
| Rev. 1.24.7 | | | | | | | |

PCS 1xRTT MODULATION

**High Frequency Fundamental Measurement
 Compliance Certification Services Chamber A**

Company: SIERRA WIRELESS
Project #: 10U13450
Date: 11/14/2010
Test Engineer: MENGISTU MEKURIA
Configuration: EUT, FEXTURE JIG, AC ADAPTER , AND LAPTOP
Mode: TX, 1xRTT PCS BAND

Test Equipment:

Receiving: Horn T73, and Camber B SMA Cables
Substitution: Horn T72 Substitution, 6ft SMA Cable (208947003) Warehouse

| f GHz | SA reading (dBm) | Ant. Pol. (H/V) | Path Loss (dBm) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|----------|---------------------|--------------------|--------------------|---------------|----------------|---------------|-------|
| 1.851 | -11.0 | V | 40.4 | 29.4 | 33.0 | -3.6 | |
| 1.851 | -13.8 | H | 39.7 | 26.0 | 33.0 | -7.0 | |
| 1.880 | -9.9 | V | 39.9 | 30.0 | 33.0 | -3.0 | |
| 1.880 | -14.2 | H | 40.1 | 25.9 | 33.0 | -7.1 | |
| 1.909 | -10.2 | V | 39.8 | 29.7 | 33.0 | -3.3 | |
| 1.909 | -14.4 | H | 40.2 | 25.7 | 33.0 | -7.3 | |

Rev. 1.24.7

9.2. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §2.1053, §22.917, §24.238
IC: RSS-132, 4.5; RSS-233, 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

For Cellular equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of 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. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

For PCS equipment - 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

- CDMA – 1xRTT

RESULTS

CELL 1xRTT MODULATION

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: SIERRA WIRELESS
Project #: 10U13450
Date: 11/29/2010
Test Engineer: MENGISTU MEKURIA
Configuration: EUT STAND ALONE
Mode: TX, CELL BND , 1xRTT MODE

Chamber

Pre-amplifier

Filter

Limit

5m Chamber A

T144 8449B

Filter 1

FCC PART 22

| f GHz | SA reading (dBm) | Ant. Pol. (H/V) | Distance (m) | Path Loss (dB) | Preamp (dB) | Filter (dB) | ERP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|-----------------------------|---------------------|--------------------|-----------------|-------------------|----------------|----------------|--------------|----------------|---------------|-------|
| LOW CH. (824.70 MHz) | | | | | | | | | | |
| 1.649 | -40.1 | H | 3.0 | 36.6 | 38.2 | 1.0 | -40.7 | -13.0 | -27.7 | |
| 2.474 | -59.3 | H | 3.0 | 40.0 | 37.5 | 1.0 | -55.8 | -13.0 | -42.8 | |
| 1.649 | -35.5 | V | 3.0 | 36.8 | 38.2 | 1.0 | -35.8 | -13.0 | -22.8 | |
| 2.474 | -56.5 | V | 3.0 | 41.7 | 37.5 | 1.0 | -51.3 | -13.0 | -38.3 | |
| MID CH. (836.52 MHz) | | | | | | | | | | |
| 1.673 | -36.1 | H | 3.0 | 36.8 | 38.1 | 1.0 | -36.4 | -13.0 | -23.4 | |
| 2.510 | -57.4 | H | 3.0 | 40.1 | 37.5 | 1.0 | -53.8 | -13.0 | -40.8 | |
| 1.673 | -33.3 | V | 3.0 | 37.1 | 38.1 | 1.0 | -33.3 | -13.0 | -20.3 | |
| 2.510 | -56.3 | V | 3.0 | 41.8 | 37.5 | 1.0 | -51.0 | -13.0 | -38.0 | |
| HI CH. (848.31 MHz) | | | | | | | | | | |
| 1.697 | -33.4 | H | 3.0 | 37.0 | 38.1 | 1.0 | -33.5 | -13.0 | -20.5 | |
| 2.545 | -56.8 | H | 3.0 | 40.3 | 37.5 | 1.0 | -52.9 | -13.0 | -39.9 | |
| 1.697 | -31.8 | V | 3.0 | 37.4 | 38.1 | 1.0 | -31.5 | -13.0 | -18.5 | |
| 2.545 | -55.7 | V | 3.0 | 42.0 | 37.5 | 1.0 | -50.2 | -13.0 | -37.2 | |

Rev. 03.03.09

PCS 1xRTT MODULATION

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: SIERRA WIRELESS
Project #: 10U13450
Date: 11/29/2010
Test Engineer: MENGISTU MEKURIA
Configuration: EUT STAND ALONE
Mode: TX, PCS BND , 1xRTT MODE

Chamber

5m Chamber A

Pre-amplifier

T144 8449B

Filter

Filter 1

Limit

FCC PART 24

| f GHz | SA reading (dBm) | Ant. Pol. (H/V) | Distance (m) | Path Loss (dB) | Preamp (dB) | Filter (dB) | EIRP (dBm) | Limit (dBm) | Delta (dB) | Notes |
|------------------------------|------------------|-----------------|--------------|----------------|-------------|-------------|------------|-------------|------------|-------|
| LOW CH. (1851.25 MHz) | | | | | | | | | | |
| 3.703 | -48.5 | H | 3.0 | 45.0 | 36.8 | 1.0 | -39.3 | -13.0 | -26.3 | |
| 5.554 | -66.3 | H | 3.0 | 49.9 | 36.3 | 1.0 | -51.6 | -13.0 | -38.6 | |
| 3.703 | -41.4 | V | 3.0 | 44.9 | 36.8 | 1.0 | -32.3 | -13.0 | -19.3 | |
| 5.554 | -60.7 | V | 3.0 | 49.3 | 36.3 | 1.0 | -46.7 | -13.0 | -33.7 | |
| MID CH. (1880.00 MHz) | | | | | | | | | | |
| 3.760 | -42.4 | H | 3.0 | 45.2 | 36.8 | 1.0 | -33.0 | -13.0 | -20.0 | |
| 5.640 | -63.6 | H | 3.0 | 50.1 | 36.3 | 1.0 | -48.8 | -13.0 | -35.8 | |
| 3.760 | -37.2 | V | 3.0 | 45.1 | 36.8 | 1.0 | -27.9 | -13.0 | -14.9 | |
| 5.640 | -57.7 | V | 3.0 | 49.4 | 36.3 | 1.0 | -43.6 | -13.0 | -30.6 | |
| HI CH. (1908.75 MHz) | | | | | | | | | | |
| 3.818 | -47.8 | H | 3.0 | 45.3 | 36.7 | 1.0 | -38.2 | -13.0 | -25.2 | |
| 5.726 | -62.4 | H | 3.0 | 50.2 | 36.3 | 1.0 | -47.4 | -13.0 | -34.4 | |
| 3.818 | -41.5 | V | 3.0 | 45.2 | 36.7 | 1.0 | -32.0 | -13.0 | -19.0 | |
| 5.726 | -53.5 | V | 3.0 | 49.5 | 36.3 | 1.0 | -39.3 | -13.0 | -26.3 | |

Rev. 03.03.09

9.3. RECEIVER SPURIOUS EMISSIONS

LIMIT

RSS-Gen 7.2.2

Spurious Emission Limits for Receivers:

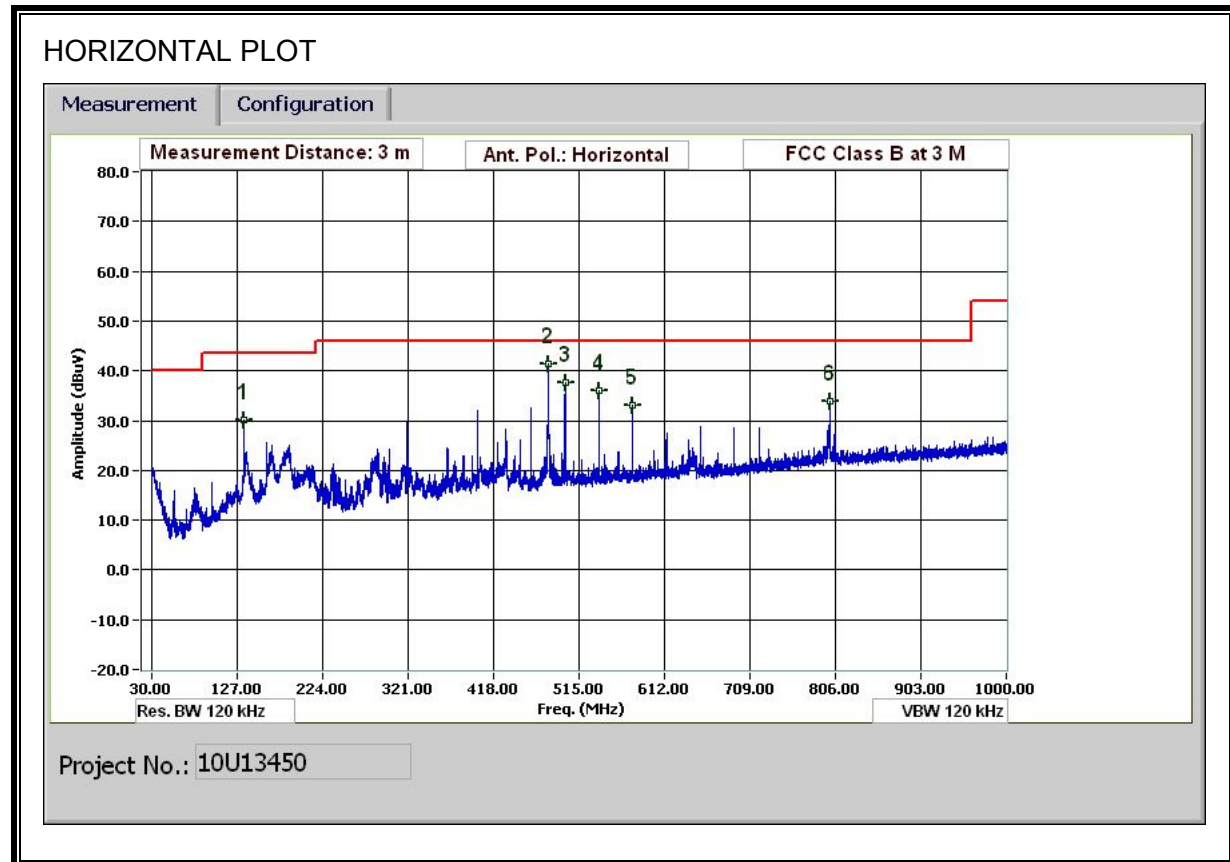
| Spurious Frequency (MHz) | Field Strength (microvolts/m at 3 metres) |
|-----------------------------|---|
| 30-88 | 100 |
| 88-216 | 150 |
| 216-960 | 200 |
| Above 960 | 500 |

TEST PROCEDURE

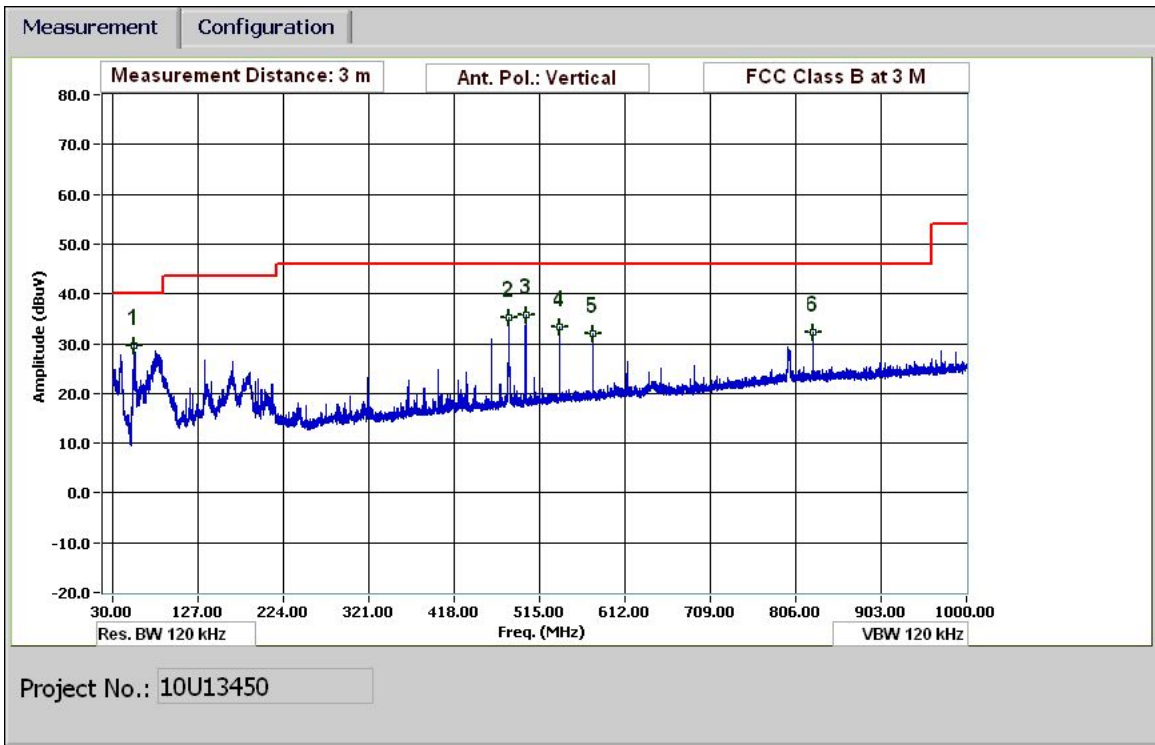
The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (local oscillator frequency, intermediate frequency or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tunable and local oscillator frequencies.

RESULTS

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

30-1000MHz Frequency Measurement

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Mengistu Mekuria
 Date: 10/11/10
 Project #: 10U13450
 Company: Sierra Wireless Inc.
 Test Target: FCC Class B
 Mode Oper: TX_GTM-2 (Worst-Case)

f Measurement Frequency Amp Preamp Gain Margin Margin vs. Limit
 Dist Distance to Antenna D Corr Distance Correct to 3 meters
 Read Analyzer Reading Filter Filter Insert Loss
 AF Antenna Factor Corr. Calculated Field Strength
 CL Cable Loss Limit Field Strength Limit

| f MHz | Dist (m) | Read dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Pad dB | Corr. dBuV/m | Limit dBuV/m | Margin dB | Ant. Pol V/H | Det. P/A/QP | Notes |
|----------|-------------|--------------|------------|----------|-----------|--------------|-----------|-----------------|-----------------|--------------|-----------------|----------------|-------|
| 134.404 | 3.0 | 45.0 | 13.5 | 1.0 | 29.4 | 0.0 | 0.0 | 30.1 | 43.5 | -13.4 | H | P | |
| 480.019 | 3.0 | 52.5 | 16.4 | 2.1 | 29.6 | 0.0 | 0.0 | 41.4 | 46.0 | -4.6 | H | P | |
| 499.219 | 3.0 | 48.4 | 16.8 | 2.1 | 29.7 | 0.0 | 0.0 | 37.6 | 46.0 | -8.4 | H | P | |
| 537.621 | 3.0 | 46.0 | 17.3 | 2.2 | 29.7 | 0.0 | 0.0 | 35.9 | 46.0 | -10.1 | H | P | |
| 576.023 | 3.0 | 42.6 | 17.9 | 2.3 | 29.7 | 0.0 | 0.0 | 33.2 | 46.0 | -12.8 | H | P | |
| 799.952 | 3.0 | 39.2 | 21.0 | 2.8 | 29.2 | 0.0 | 0.0 | 33.8 | 46.0 | -12.2 | H | P | |
| 54.121 | 3.0 | 50.6 | 7.9 | 0.6 | 29.6 | 0.0 | 0.0 | 29.5 | 40.0 | -10.5 | V | P | |
| 480.019 | 3.0 | 46.2 | 16.4 | 2.1 | 29.6 | 0.0 | 0.0 | 35.1 | 46.0 | -10.9 | V | P | |
| 499.219 | 3.0 | 46.5 | 16.8 | 2.1 | 29.7 | 0.0 | 0.0 | 35.7 | 46.0 | -10.3 | V | P | |
| 537.621 | 3.0 | 43.5 | 17.3 | 2.2 | 29.7 | 0.0 | 0.0 | 33.4 | 46.0 | -12.6 | V | P | |
| 576.023 | 3.0 | 41.4 | 17.9 | 2.3 | 29.7 | 0.0 | 0.0 | 32.0 | 46.0 | -14.0 | V | P | |
| 825.993 | 3.0 | 37.4 | 21.1 | 2.9 | 29.0 | 0.0 | 0.0 | 32.4 | 46.0 | -13.6 | V | P | |

Rev. 1.27.09

Note: No other emissions were detected above the system noise floor.

SPURIOUS EMISSIONS ABOVE 1000 MHz (WORST-CASE CONFIGURATION)

Note: No emissions were detected above the system noise floor.

9.4. POWER LINE CONDUCTED EMISSION

LIMIT

RSS-Gen 7.2.2

Except when the requirements applicable to a given device state otherwise, for any licence-exempt radio communication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in Table 2. The tighter limit applies at the frequency range boundaries.

Table 2 – AC Power Lines Conducted Emission Limits

| Frequency of Emission (MHz) | Conducted Limit (dBuV) | |
|-----------------------------|------------------------|-----------|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*Decreases with the logarithm of the frequency.

RESULTS

6 WORST EMISSIONS

AC ADAPTER

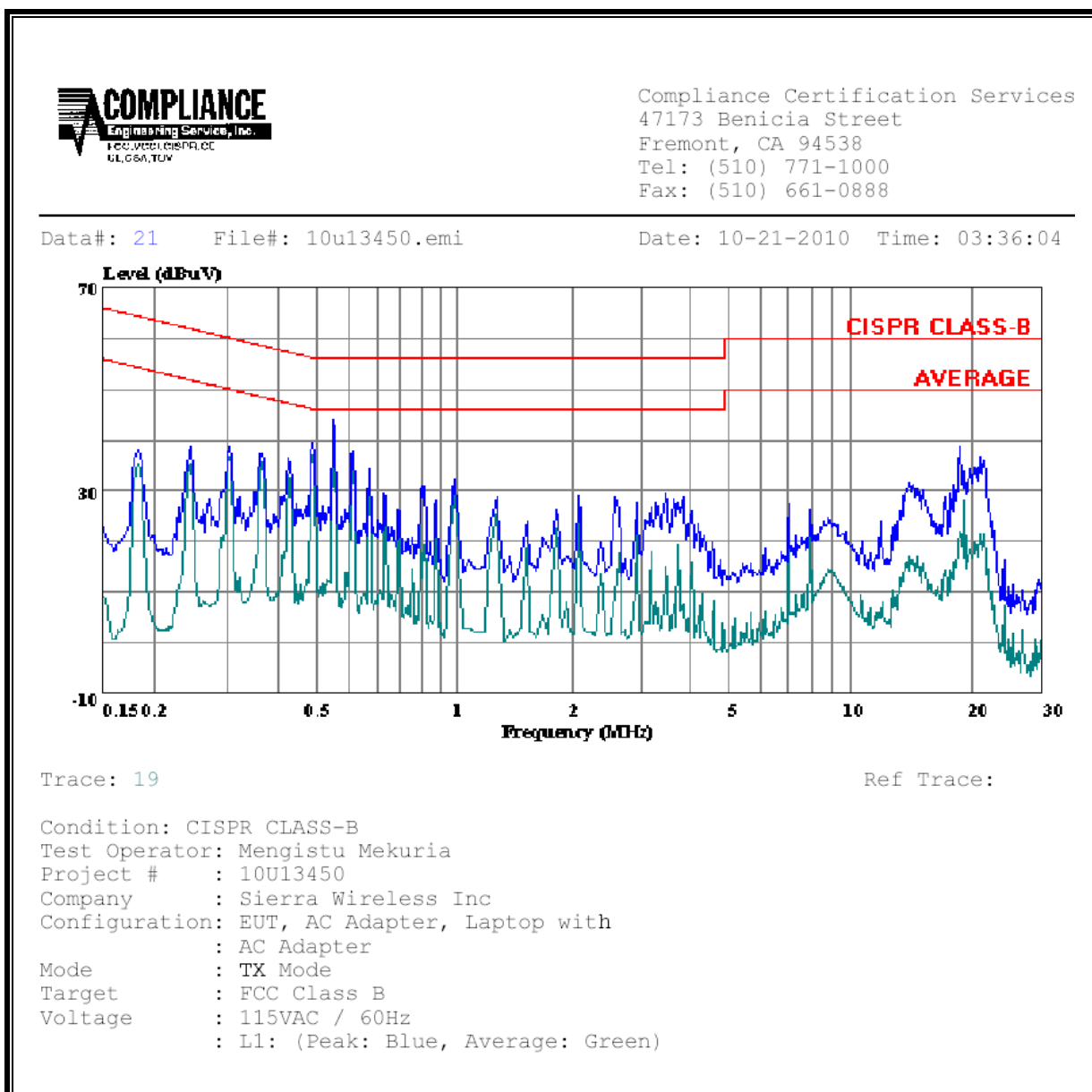
| CONDUCTED EMISSIONS DATA (115VAC 60Hz) | | | | | | | | | |
|--|-----------|-----------|-----------|-------|-------|-------|---------|---------|---------|
| Freq. | Reading | | | Class | Limit | EN B | Margin | | Remark |
| (MHz) | PK (dBuV) | QP (dBuV) | AV (dBuV) | (dB) | QP | AV | QP (dB) | AV (dB) | L1 / L2 |
| 0.20 | 48.75 | -- | 34.14 | 0.00 | 63.61 | 53.61 | -14.86 | -19.47 | L1 |
| 0.40 | 36.35 | -- | 24.20 | 0.00 | 57.90 | 47.90 | -21.55 | -23.70 | L1 |
| 0.60 | 31.85 | -- | 21.16 | 0.00 | 56.00 | 46.00 | -24.15 | -24.84 | L1 |
| 0.20 | 51.49 | -- | 34.18 | 0.00 | 63.61 | 53.61 | -12.12 | -19.43 | L2 |
| 0.29 | 42.16 | -- | 27.95 | 0.00 | 60.50 | 50.50 | -18.34 | -22.55 | L2 |
| 0.40 | 36.05 | -- | 26.28 | 0.00 | 57.85 | 47.85 | -21.80 | -21.57 | L2 |
| 6 Worst Data | | | | | | | | | |

SUPPORT LAPTOP

| CONDUCTED EMISSIONS DATA (115VAC 60Hz) | | | | | | | | | |
|--|-----------|-----------|-----------|-------|-------|-------|---------|---------|---------|
| Freq. | Reading | | | Class | Limit | EN B | Margin | | Remark |
| (MHz) | PK (dBuV) | QP (dBuV) | AV (dBuV) | (dB) | QP | AV | QP (dB) | AV (dB) | L1 / L2 |
| 0.17 | 55.74 | -- | 47.70 | 0.00 | 65.21 | 55.21 | -9.47 | -7.51 | L1 |
| 0.22 | 52.44 | -- | 42.67 | 0.00 | 63.01 | 53.01 | -10.57 | -10.34 | L1 |
| 0.55 | 47.18 | -- | 34.74 | 0.00 | 56.00 | 46.00 | -8.82 | -11.26 | L1 |
| 0.16 | 57.32 | -- | 48.55 | 0.00 | 65.62 | 55.62 | -8.30 | -7.07 | L2 |
| 0.61 | 47.88 | -- | 37.44 | 0.00 | 56.00 | 46.00 | -8.12 | -8.56 | L2 |
| 0.69 | 47.02 | -- | 37.57 | 0.00 | 56.00 | 46.00 | -8.98 | -8.43 | L2 |
| 6 Worst Data | | | | | | | | | |

AC ADAPTER

LINE 1 RESULTS

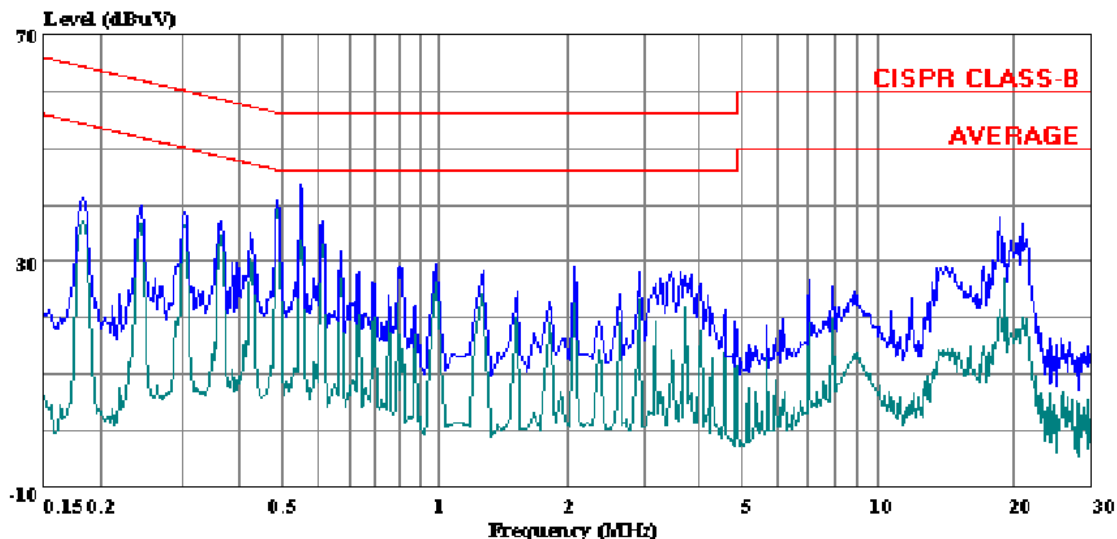


LINE 2 RESULTS



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

Data#: 28 File#: 10u13450.emi Date: 10-21-2010 Time: 03:41:14



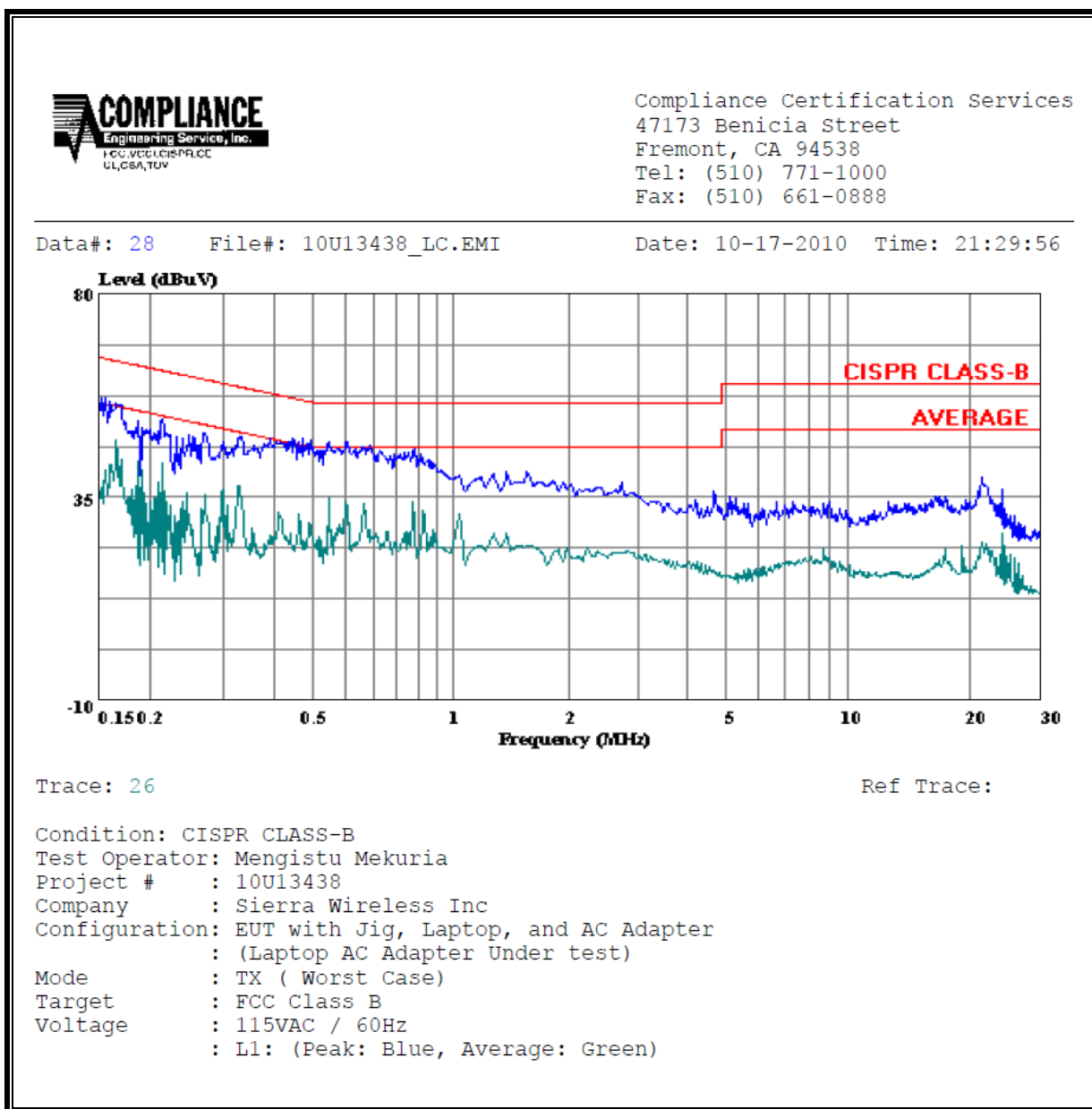
Trace: 26

Ref Trace:

Condition: CISPR CLASS-B
Test Operator: Mengistu Mekuria
Project # : 10U13450
Company : Sierra Wireless Inc
Configuration: EUT, AC Adapter, Laptop with
 : AC Adapter
Mode : TX Mode
Target : FCC Class B
Voltage : 115VAC / 60Hz
 : L2: (Peak: Blue, Average: Green)

SUPPORT LAPTOP

LINE 1 RESULTS

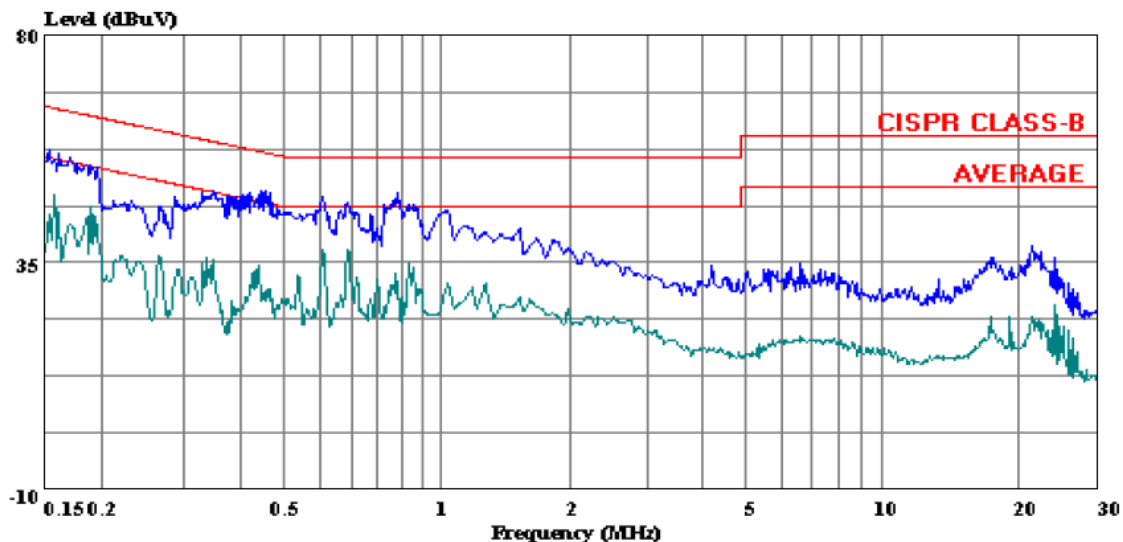


LINE 2 RESULTS



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

Data#: 21 File#: 10U13438_LC.EMI Date: 10-17-2010 Time: 21:24:34



Trace: 19

Ref Trace:

Condition: CISPR CLASS-B
Test Operator: Mengistu Mekuria
Project # : 10U13438
Company : Sierra Wireless Inc
Configuration: EUT with Jig, Laptop, and AC Adapter
 : (Laptop AC Adapter Under test)
Mode : TX (Worst Case)
Target : FCC Class B
Voltage : 115VAC / 60Hz
 : L2: (Peak:Blue, Average: Green)

10. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§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 ²) | 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 ²) | 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 ²) | 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 ²) | 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.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

**Table 5
 Exposure Limits for Persons Not Classified As RF and Microwave Exposed Workers (Including the General Public)**

| 1 Frequency (MHz) | 2 Electric Field Strength; rms (V/m) | 3 Magnetic Field Strength; rms (A/m) | 4 Power Density (W/m ²) | 5 Averaging Time (min) |
|-------------------------|---|---|--|-----------------------------------|
| 0.003–1 | 280 | 2.19 | | 6 |
| 1–10 | 280/ <i>f</i> | 2.19/ <i>f</i> | | 6 |
| 10–30 | 28 | 2.19/ <i>f</i> | | 6 |
| 30–300 | 28 | 0.073 | 2* | 6 |
| 300–1 500 | 1.585 <i>f</i> ^{0.5} | 0.0042 <i>f</i> ^{0.5} | <i>f</i> /150 | 6 |
| 1 500–15 000 | 61.4 | 0.163 | 10 | 6 |
| 15 000–150 000 | 61.4 | 0.163 | 10 | 616 000 / <i>f</i> ^{1.2} |
| 150 000–300 000 | 0.158 <i>f</i> ^{0.5} | 4.21 x 10 ⁻⁴ <i>f</i> ^{0.5} | 6.67 x 10 ⁻⁵ <i>f</i> | 616 000 / <i>f</i> ^{1.2} |

* Power density limit is applicable at frequencies greater than 100 MHz.

- Notes:**
1. Frequency, *f*, is in MHz.
 2. A power density of 10 W/m² is equivalent to 1 mW/cm².
 3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

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, rearranging the terms to express the distance as a function of the remaining variables, changing to units of Power to mW and Distance to cm, and substituting the logarithmic form of power and gain yields:

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

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm²

Rearranging terms to calculate the power density at a specific distance yields

$$S = 0.0795 * 10^{((P + G) / 10)} / (d^2)$$

The power density in units of mW/cm² is converted to units of W/m² by multiplying by a factor of 10.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 0.5498 mW/cm² (Cell) and S = 1.0 mW/cm² (PCS)

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 5.498 mW/cm² (Cell) and S = 10 mW/cm² (PCS)

RESULTS

| Band | MPE Distance (cm) | Output Power (dBm) | Max Antenna Gain (dBi) | FCC Power Density (mW/cm ²) | IC Power Density (W/m ²) |
|------|-------------------|--------------------|------------------------|---|--------------------------------------|
| Cell | 20.0 | 29.75 | 4.65 | 0.547 | 5.474 |
| PCS | 20.0 | 24.69 | 8.30 | 0.396 | 3.956 |