

REPORT OF MEASUREMENTS
FOR
CELLULAR SPECIALTIES, INC.
DUAL BAND BIDIRECTIONAL AMPLIFIER
MODEL: CSI-BDA61080-C/P
FCC ID: NVRCSI610-AP

CERTIFICATION APPLICATION

Applicant/Manufacturer: **Cellular Specialties
670 North Commercial Street
Manchester, NH 03101**

Equipment under Test (EUT): **The EUT is a Dual Band Bidirectional Amplifier used to amplify cellular signals in the Cellular & PCS bands.**

Model: **CSI-BDA61080-C/P**

FCC ID Number: **FCC ID: NVRC610-AP**

Applicable Test Standard: **FCC Parts 2, 22, Subpart E & 24, Subpart H**

Device Classification: **Mobile**

EUT Frequency Range PCS Band: **Uplink: 1850MHz TO 1910MHz
Downlink: 1930MHz TO 1990MHz**

EUT Frequency Range Cellular Band: **Uplink: 824MHz TO 849MHz
Downlink: 869MHz TO 894MHz**

Power Output Rating Based on max input single channel (For Certification Grant): **Cellular Band Uplink: 613mW
Cellular Band Downlink: 631mW
PCS Band Uplink: 303mW
PCS Band Downlink: 316mW**

Modulation Type: **CDMA, TDMA, FM (covers GSM and F1D)**

RF Exposure + Antenna Installation: **See Attached Installation/Users Manual and MPE Evaluation**

Power Ratings Per Channel: **See Power Per Channel Test Data**

Measurements Required by FCC: **See Report Section 1 (Summary of Test Program) and the following Test Report Data Attachments:**

- RF Power Output**
- Intermodulation Characteristics (Two-Tone)**
- Occupied Bandwidth**
- Spurious Emissions at Antenna Terminals**
- Effective Radiated Power of Spurious Radiation**
- Frequency Stability**

SECTION 1 SUMMARY OF TEST PROGRAM

INTERMODULATION CHARACTERISTICS (TWO TONE)

Measurement Procedure:

Two signals were injected, in turn, to each uplink and downlink frequency band via a two way power combiner. Testing was performed at both the low band edge and high band edge of each pass band. The output of each signal generator was adjusted so that the two output fundamental frequencies were equal in magnitude. Testing was performed for TDMA, CDMA and FM (Covers GSM and F1D) Modulation types. At the maximum specified input power levels all intermodulation products were at -13dBm or below for each modulation. See attached test data.

OCCUPIED BANDWIDTH

Measurement Procedure:

For Occupied Bandwidth, measurements were made to compare the input signal to the output signal. The signal generator output was connected to the spectrum analyzer. A TDMA modulation signal was then applied to the carrier. Waveforms were then noted on an X-Y plot. Next, the signal generator was connected to the EUT and the output of the EUT was connected to the spectrum analyzer. The output waveform after amplification was then compared to the original input signal to ensure that no significant differences occurred between the input signal and the amplified signal. Testing was performed at two frequencies within each passband (uplink and downlink). Testing was repeated for CDMA and FM (Covers GSM and F1D) Modulation Types. See Occupied Bandwidth Data. An explanation of the data is as follows: There are two signals superimposed on each plot, one signal is the waveform before modulation, the other is the modulated carrier. In each case the center of the grid shows a narrowband signal projecting out from the center of the modulation envelope. This signal is actually the stored unmodulated signal.

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Measurement Procedure:

The signal generator output was connected in turn to the uplink and downlink input ports of the EUT. The input power level was at the maximum level which was ascertained during the Power Output test. A spectrum analyzer was connected to the output of the EUT. The input test frequencies used were three frequencies within each passband (uplink and downlink). The level of any spurious emission was recorded. Testing was performed in the frequency range of 30MHz to 20GHz. Testing was performed for TDMA, CDMA and FM modulation types. The spurious emissions limit is -13dBm as specified in FCC Parts 22 & 24. All emissions were below the specified -13dBm limit. See attached test data.

EFFECTIVE RADIATED POWER OF SPURIOUS RADIATION

Measurement Procedure:

The test sample was placed on a 80cm high wooden test stand which was located 3 meters from the test antenna on an FCC listed test site. A signal generator was connected to the input of the amplifier. The signal generator output was set to provide the input power level necessary to achieve maximum output power of the amplifier at 3 frequencies within each passband (uplink and downlink). The effective radiated power of each out of band spurious emission was measured using the substitution method specified in TIA/EIA-603. The frequency range of the test was 30MHz – 20GHz. The limit for out of band spurious emissions is -13dBm as specified in Parts 22 & 24. All emissions were below the specified -13dBm limit. See attached test data.

RF POWER OUTPUT

A signal generator was connected in turn to the uplink and downlink input ports of the test sample. The signal generator was set to maximum input rating and the amplifier was operating at maximum gain. The maximum single channel output power for both the uplink and downlink was measured with a spectrum analyzer connected to the output port. The maximum measured output power in the cellular band frequency ranges of 824MHz to 849MHz (uplink) and 869MHz to 894MHz (downlink) was 26dBm (398mW) and the maximum measured output power in the PCS frequency ranges of 1850MHz to 1910MHz (uplink) and 1930MHz to 1990MHz (downlink) was 21dBm (126mW) which matched the manufacturer's rated output power. See attached test data.

FREQUENCY STABILITY MEASUREMENTS

As the test sample is designed to amplify input signals from a cellular network and contains no frequency determining components frequency stability measurements were not required/performed.

SECTION 2
EQUIPMENT LISTS

Spurious Emissions at Antenna Terminals

| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due |
|-----------|-----------------------|---------------------|--------------------|------------------|-----------------|------------|
| 4895 | Spectrum Analyzer | Hewlett Packard | 9kHz - 22GHz | 8593EM | 9/20/2005 | 9/20/2006 |
| 5016 | Attenuator | Narda | DC - 18 GHz | 776B-30 | 2/8/2006 | 2/8/2007 |
| 5030C | 10 DB Atten. (50 ohm) | Narda | DC - 12.4 GHz | 757C-10 | 2/7/2006 | 2/7/2007 |
| R420 | Signal Generator | Agilent | 250kHz - 3GHz | AT-E4436B | 7/25/2005 | 7/25/2007 |

EQUIPMENT LIST

Radiated Spurious Emissions

| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due |
|-----------|---------------------|---------------------|--------------------|------------------|-----------------|------------|
| 3116 | Pre-Amplifier | Miteq | 0.1 GHz - 18 GHz | AFS42-35 | 08/25/2006 | 08/25/2007 |
| 4972 | Coaxial Termination | Philco | DC - 1 GHz | 1608-150 | 02/02/2006 | 02/02/2007 |
| 5053 | Biconilog | EMCO | 26 MHz - 3000 MHz | 3142C | 02/07/2006 | 02/07/2007 |
| 713 | EMI Test Receiver | Rohde & Schwarz | 20 Hz - 26.5 GHz | ESI26 | 04/03/2006 | 04/03/2007 |
| 3258 | Double Ridge Guide | EMCO | 1 - 18 GHz | 3115 | 10/25/2005 | 10/25/2006 |
| 3430 | Horn | MCS | 18 - 26.5GHz | K-5039 | 1/25/2006 | 1/25/2007 |

RF Power Output/Occupied Bandwidth

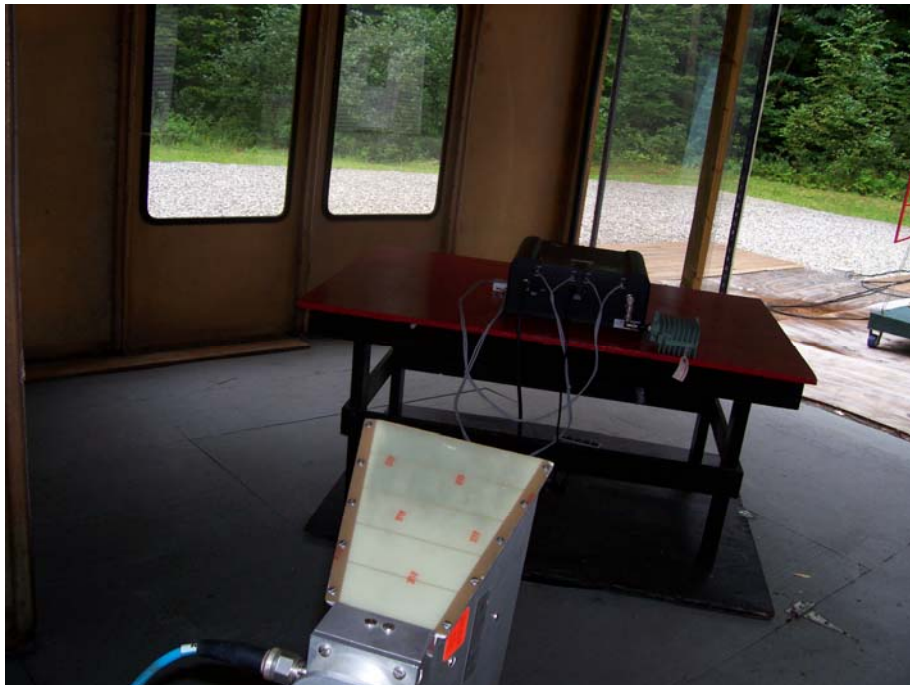
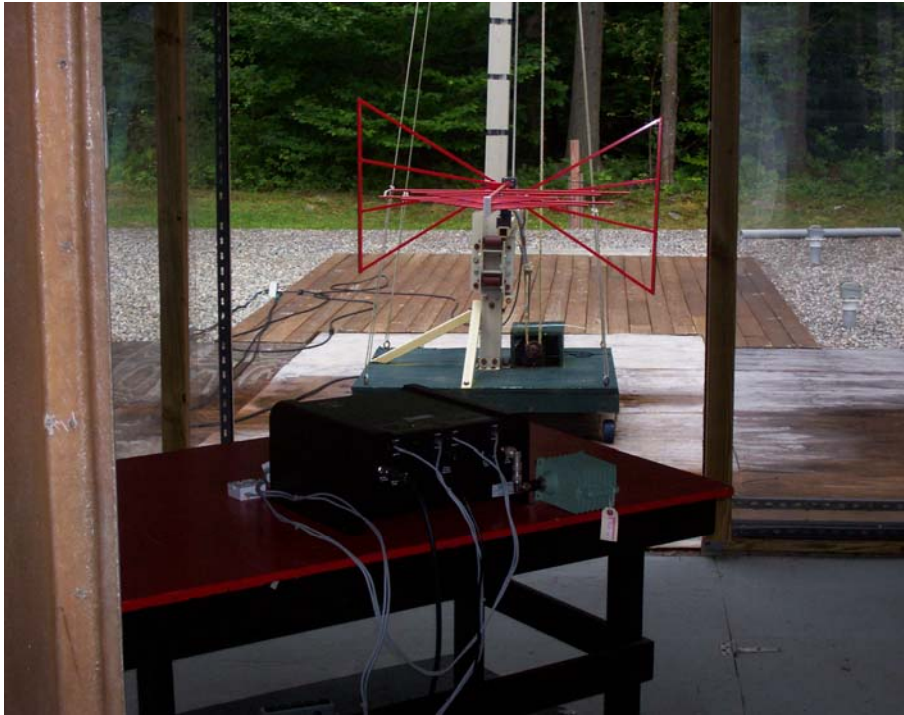
| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due |
|-----------|-----------------------|---------------------|--------------------|------------------|-----------------|------------|
| 4895 | Spectrum Analyzer | Hewlett Packard | 9kHz - 22GHz | 8593EM | 9/20/2005 | 9/20/2006 |
| 5016 | Attenuator | Narda | DC - 18 GHz | 776B-30 | 2/8/2006 | 2/8/2007 |
| 5030C | 10 DB Atten. (50 ohm) | Narda | DC - 12.4 GHz | 757C-10 | 2/7/2006 | 2/7/2007 |
| R420 | Signal Generator | Agilent | 250kHz - 3GHz | AT-E4436B | 7/25/2005 | 7/25/2007 |
| 4962 | Attenuator | Narda | DC - 18 GHz | 757C-20dB | 02/07/2006 | 02/07/2007 |
| 4972 | Coaxial Termination | Philco | DC - 1 GHz | 1608-150 | 02/02/2006 | 02/02/2007 |
| 5016 | 30 dB Attenuator | Narda | DC - 18 GHz | 776B-30 | 02/08/2006 | 02/08/2007 |

Intermodulation (Two Tone)

| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due |
|-----------|-----------------------|---------------------|--------------------|------------------|-----------------|------------|
| 4895 | Spectrum Analyzer | Hewlett Packard | 9kHz - 22GHz | 8593EM | 9/20/2005 | 9/20/2006 |
| 5016 | Attenuator | Narda | DC - 18 GHz | 776B-30 | 2/8/2006 | 2/8/2007 |
| 5030C | 10 DB Atten. (50 ohm) | Narda | DC - 12.4 GHz | 757C-10 | 2/7/2006 | 2/7/2007 |
| R420 | Signal Generator | Agilent | 250kHz - 3GHz | AT-E4436B | 7/25/2005 | 7/25/2007 |

Test Report No. R-4609N-3
FCC ID: NVRCSI610-AP

SPURIOUS RADIATED EMISSIONS



SPURIOUS EMISSIONS AT ANTENNA TERMINALS
OCCUPIED BANDWIDTH/RF POWER OUTPUT
INTERMODULATION (TWO TONE)

