REPORT OF MEASUREMENTS

FOR

CELLULAR SPECIALTIES, INC.

BI-DIRECTIONAL AMPLIFIER

MODEL: CSI610-S9

FCC ID: NVRCSI610-S9

CERTIFICATION APPLICATION

Applicant/Manufacturer:	**Cellular Specialties** **670 North Commercial Street** **Manchester, NH 03101**
Equipment under Test (EUT):	**The EUT is a Bidirectional Amplifier used to amplify cellular signals in the smr band.**
Model:	**CSI610-S9**
FCC ID Number:	**FCC ID: NVRCSI610-S9**
Applicable Test Standard:	**FCC Parts 2 & 90**
Device Classification:	**Mobile**
EUT Frequency Range:	**Uplink: 896MHz TO 901MHz** **Downlink: 935MHz TO 940MHz**
EUT Gain:	**Uplink: 85dB** **Downlink: 85dB**
Power Output Rating Based on Two-Tone Intermodulation Data (For Certification Grant):	**Uplink: +30.79Bm=1200mW** **Downlink: +30.55dBm=1136mW**
Modulation Type:	**TDMA**
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**

SECTION 1
SUMMARY OF TEST PROGRAM

INTERMODULATION CHARACTERISTICS (TWO TONE)/RF POWER OUTPUT

Measurement Procedure:

Two TDMA 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. At the maximum specified input power levels all intermodulation products were at -13dBm or below. The RF Power Output Rating of the device for the certification grant is derived by summing the levels of the two input signals for each uplink and downlink frequency band.

For complete test data, including actual X/Y plots of intermodulation signals, see electronic Test Report Attachments, **Intermodulation Characteristics (Two-Tone) Data & RF Power Output Data.**

OCCUPIED BANDWIDTH

Measurement Procedure:

The test sample does not have any frequency generating circuits therefore 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 emission mask requirement for TDMA signals (46dB down at plus and minus one channel spacing, 30kHz). Testing was performed at one frequency within each passband (uplink and downlink).

For complete test data, see electronic Test Report Attachment, **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 9.5GHz. The spurious emissions limit is -13dBm as specified in FCC Part 90.
For complete test data, including harmonic and spurious emissions measured at antenna terminal, see electronic Test Report Attachment, **Spurious Emissions At Antenna Terminals 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 frequencies5 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 – 9.5GHz. The limit for out of band spurious emissions is -13dBm as specified in Part 90.
For complete test data, see electronic Test Report Attachment, **Radiated Emissions Data**.

FREQUENCY STABILITY MEASUREMENTS

The test sample does not have any frequency determining circuits therefore testing was not required/performed.

SECTION 2

EQUIPMENT LIST

Occupied Bandwidth

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due
713	EMI Test Receiver	Rohde & Schwarz	20 Hz - 26.5 GHz	ESI26	3/22/2005	3/22/2006
5030D	10 DB Atten. (50 ohm)	Narda	DC - 12.4 GHz	757C-10	2/8/2005	2/8/2006
5038	10 DB Atten. (50 ohm)	Fluke	DC - 12.4 GHz	Y9304	2/7/2005	2/7/2006
	Signal Generator	Hewlett Packard	250 kHz – 2 GHz	E4431B	2/15/2005	2/15/2006

Spurious Emissions at Antenna Terminals

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due
4895	Spectrum Analyzer	Hewlett Packard	9kHz - 22GHz	8593EM	4/22/2004	4/22/2005
5030A	10 DB Atten. (50 ohm)	Narda	DC - 12.4 GHz	757C-10	2/7/2005	2/7/2006
5030D	10 DB Atten. (50 ohm)	Narda	DC - 12.4 GHz	757C-10	2/8/2005	2/8/2006
5046	AM/FM Signal Generator	Marconi Instru.	10 kHz - 1.2 GHz	2023A	9/16/2004	9/16/2005
713	EMI Test Receiver	Rohde & Schwarz	20 Hz - 26.5 GHz	ESI26	3/22/2005	3/22/2006

Spurious Radiated Emissions

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due
3258	Double Ridge Guide	EMCO	1 - 18 GHz	3115	6/1/2004	6/1/2005
4029B	Test Site Attenuation	Retlif	3 / 10 Meters	RNH	12/3/2004	12/3/2005
4202	Biconilog	EMCO	26 MHz - 2 GHz	3142	12/13/2004	12/13/2005
713	EMI Test Receiver	Rohde & Schwarz	20 Hz - 26.5 GHz	ESI26	3/22/2005	3/22/2006
5046	AM/FM Signal Generator	Marconi Instru.	10 kHz - 1.2 GHz	2023A	9/16/2004	9/16/2005

Intermodulation (Two Tone)/RF Power Output

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due
4895	Spectrum Analyzer	Hewlett Packard	9kHz - 22GHz	8593EM	4/22/2004	4/22/2005
5030D	10 DB Atten. (50 ohm)	Narda	DC - 12.4 GHz	757C-10	2/8/2005	2/8/2006
5038	10 DB Atten. (50 ohm)	Fluke	DC - 12.4 GHz	Y9304	2/7/2005	2/7/2006
	Signal Generator	Hewlett Packard	250 kHz – 2 GHz	E4431B	2/15/2005	2/15/2006

TEST SET UP PHOTOGRAPHS

INTERMODULATION (TWO TONE)

OCCUPIED BANDWIDTH

SPURIOUS EMISSIONS AT ANTENNA TERMINALS

SPURIOUS RADIATED EMISSIONS 1

SPURIOUS RADIATED EMISSIONS 2