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REPORT OF MEASUREMENTS

FOR CELLULAR SPECIALTIES, INC.

BI-DIRECTIONAL DIGITAL REPEATER

MODEL: CSI-DSP85-PSS8

FCC ID: NVRCSI-DSP85-PSS8

Company Name:	<u>Cellular Specialties, Inc.</u>
Date of Report:	<u>August 4, 2009</u>
Test Report No:	<u>R-5185N-1</u>
Test Start Date:	<u>July 23, 2009</u>
Test Finish Date:	<u>July 28, 2009</u>
Test Technician:	<u>Matt Seamans</u>
Lab Supervisor:	<u>Todd Hannemann</u>
Report Prepared By:	<u>Jamie Ramsey</u>

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We certify that this report is a true report of the results obtained from the tests of the equipment stated and relates only to the equipment tested. We further certify that the measurements shown in this report were made in accordance with the procedures indicated and vouch for the qualifications of all Retrif Testing Laboratories personnel taking them.



Scott Wentworth
Branch Manager
NVLAP Approved Signatory



Todd Hannemann
Laboratory Supervisor

Non-Warranty Provision

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This test report contains only findings and results arrived at after employing the specific test procedures and standards listed herein. It is not intended to constitute a recommendation, endorsement, or certification of the product or material tested. This report must not be used by the client to claim product endorsement by NVLAP, NIST or any agency of the U.S. Government.

Test Report No. R-5185N-1
FCC ID: NVRCSI-DSP85-PSS8

CERTIFICATION APPLICATION SUMMARY

Applicant/Manufacturer:	Cellular Specialties 670 North Commercial Street Manchester, NH 03101
Equipment under Test (EUT):	The EUT is a BI-DIRECTIONAL DIGITAL REPEATER
Model:	CSI-DSP85-PSS8
FCC ID Number:	FCC ID: NVRCSI-DSP85-PSS8
Applicable Test Standard:	FCC Parts 2 & 90
Measurement Procedure:	ANSI/TIA-603-C-2004
Device Classification:	Mobile
EUT Frequency Bands:	Uplink: 806MHz to 824MHz Downlink: 851MHz to 869MHz
Power Output Rating Based on two tone composite power (For Certification Grant):	Uplink: +30.5dBm = 1.12W Downlink: +28.05dBm = 0.639W
Modulation Types:	TDMA (DXW)
RF Exposure + Antenna Installation:	See Attached Installation/Users Manual and MPE Evaluation
Measurements Required by FCC:	See Report Section 1 (Summary of Test Program) and the following Test Report Data Attachments: <ul style="list-style-type: none">-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 Modulation type. At the maximum specified input power levels all intermodulation products were at -13dBm or below.

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 one frequency within each passband (uplink and downlink). See Occupied Bandwidth Data.

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 (low, mid & high) within each passband (uplink and downlink). The level of any spurious emission was recorded. Testing was performed in the frequency range of 30MHz to 9GHz. Testing was performed for TDMA modulation type. The spurious emissions limit is -13dBm as specified in FCC Part 90. 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 (low, mid & high) 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 ANSI/TIA-603-C-2004. The frequency range of the test was 30MHz – 9GHz. The limit for out of band spurious emissions is -13dBm as specified in Part 90. All emissions were below the specified -13dBm limit. See attached test data.

RF POWER OUTPUT

The RF Power Output rating for both the uplink and downlink frequency bands was calculated using the composite power value from the intermodulation two tone test data. The measured output power matched the manufacturer's rated output power. See attached test data.

FREQUENCY STABILITY MEASUREMENTS

The test sample was placed into a temperature chamber with the AC input power supplied through a variable power source. A signal generator was used to provide the input signal and the output was measured with a frequency counter. With the test sample operating at maximum output power the test sample's output frequency was measured and recorded at the extremes of the temperature range and at 10 degree increments from -30 degrees C to +50 degrees C while the AC input voltage was varied from 85 to 115% of nominal. The output frequency for both the passband uplink and downlink stayed within the assigned frequency band. See attached test data.

SECTION 2

EQUIPMENT LISTS

Spurious Radiated Emissions

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
3116	Pre-Amplifier	Miteq	0.1 GHz - 18 GHz	AFS42-35	1/21/2009	1/21/2010
3117	Power Supply	B&K Precision	0-30 Vdc, 3.0 A	1630	1/31/2008	1/31/2010
3258	Double Ridge Guide	EMCO	1 - 18 GHz	3115	8/20/2008	8/20/2009
4029B	Test Site Attenuation	Retlif	3 / 10 Meters	RNH	6/25/2009	6/25/2010
5053	Biconilog	EMCO	26 MHz - 3 GHz	3142C	1/27/2009	1/27/2010
R420B	Signal Generator	Agilent	250 kHz - 3 GHz	AT/E4437B;F	9/9/2008	10/7/2010
R425B	Spectrum Analyzer	Agilent	100 Hz - 26.5 GHz	E7405A;A	5/11/2009	5/11/2010

RF Power Output

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
4961	Attenuator	Narda	DC - 18 GHz	757C-30dB	1/20/2009	1/20/2010
5030C	10 DB Atten. (50 ohm)	Narda	DC - 12.4 GHz	757C-10	9/23/2008	9/23/2009
R420B	Signal Generator	Agilent	250 kHz - 3 GHz	AT/E4437B;F	9/9/2008	10/7/2010
R425B	Spectrum Analyzer	Agilent	100 Hz - 26.5 GHz	E7405A;A	5/11/2009	5/11/2010

Frequency Stability

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
4997	Digital Thermometer	Omega	N/A		9/28/2008	9/28/2009
5013	Variac	Powerstat	0 - 140 VAC	116B	4/30/2008	4/30/2010
5049B	Digital Multimeter	Fluke	N/A	111	8/19/2008	8/19/2009
5077	Temperature Chamber	Associated Env. Systems	-50 to 150 Deg C	ZFD-531	1/30/2008	1/30/2009
R420B	Signal Generator	Agilent	250 kHz - 3 GHz	AT/E4437B;F	9/9/2008	10/7/2010
R425B	Spectrum Analyzer	Agilent	100 Hz - 26.5 GHz	E7405A;A	5/11/2009	5/11/2010

Intermodulation Characteristics

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
4961	Attenuator	Narda	DC - 18 GHz	757C-30dB	1/20/2009	1/20/2010
5030C	10 DB Atten. (50 ohm)	Narda	DC - 12.4 GHz	757C-10	9/23/2008	9/23/2009
R420B	Signal Generator	Agilent	250 kHz - 3 GHz	AT/E4437B;F	9/9/2008	10/7/2010
R425B	Spectrum Analyzer	Agilent	100 Hz - 26.5 GHz	E7405A;A	5/11/2009	5/11/2010

Occupied Bandwidth

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4961	Attenuator	Narda	DC - 18 GHz	757C-30dB	1/20/2009	1/20/2010
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SETUP PHOTOGRAPHS
SPURIOUS RADIATED EMISSIONS
30MHz to 1000 MHz



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SETUP PHOTOGRAPHS
SPURIOUS RADIATED EMISSIONS
1 GHz to 9 GHz



Test Report No. R-5185N-1
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SPURIOUS EMISSIONS AT ANTENNA TERMINALS
OCCUPIED BANDWIDTH/RF POWER OUTPUT
INTERMODULATION (TWO TONE)



Test Report No. R-5185N-1
FCC ID: NVRC5I-DSP85-PSS8

FREQUENCY STABILITY



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FREQUENCY STABILITY



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