



Test Report:
ATEMC000043

Applicant:
Arrista Technologies Inc.
5-55 Henlow Bay
Winnipeg, MB, CA
R3Y 1G4

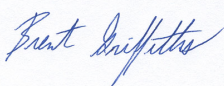
Equipment Under Test (EUT):
AMPS / TDMA / CDMA
Bi-Directional Cellular Signal Amplifier

MODEL:
CR100

FCC ID:
P35UTHNEXW9

IN ACCORDANCE WITH:
FCC PART 2,
FCC PART 22, SUBPART H
CELLULAR BAND REPEATERS

TEST LAB PERSONNEL:

Test Performed by:	Date	Signature
Paul Eberling, CNA	January 5, 2004	
Brent Griffiths	January 5, 2004	

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APPROVALS:

Date	Name	Title	Signature
January 5, 2004	Roman Wroczynski	Director Development Test &	

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Equipment: CR100 Bi-Directional Cellular Signal Amplifier

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Equipment: *CR100 Bi-Directional Cellular Signal Amplifier*

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1. GENERAL INFORMATION

1.1. TEST FACILITIES DESCRIPTION

1.1.1. INTERNAL FACILITIES

Arrista Product Compliance & Test (PCT) laboratory is located at 5-55 Henlow Bay, Winnipeg, Manitoba, Canada at Arrista main facility. The laboratory has test equipment for Electromagnetic Compatibility (EMC) testing i.e. ESD, EFT, Surge, and radiated emissions.

The PCT Laboratory is registered with the FCC and has submitted the information required by Section 2.948 of the FCC Rules for measuring devices. Test equipment used to perform all measurements listed in paragraph 1.3 of this test report.

1.1.2. RADIATED EMISSIONS TEST SITE

Radiated emissions testing was performed in Arrista's semi-anechoic 3m test chamber.

The site consists of a 28'x 20'x 20' shielded chamber with absorptive materials on the walls and ceiling. The floor of the chamber is a raised conductive ground plane and includes a 2 m conductive top turntable. The measuring antenna is mounted on a non-conductive mast, which can be raised between 1 to 4 meters. Measurement equipment is located in the adjacent control room which is a 12' x 12' x 8' shielded structure.

1.2. PURPOSE

This document details the results of the following tests performed by Arrista Technologies Inc. (Arrista) on Dec 2, 2003 – Jan 12, 2004 on the CR100 Bi-Directional Signal Repeater for Arrista Technologies Incorporated.

1.3. TEST METHODOLOGY

Arrista performed these tests on a production sample of the product for the purpose of demonstrating compliance with FCC Part 22, Subpart H. All conducted and radiated emissions testing were performed according to methods of ANSI C63.4:1992. This test report related only to the item(s) tested.

1.4. TEST EQUIPMENT LIST

All test equipment calibrations are NIST traceable to national standards. All calibration

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data can be made available on request

Radiated Test Equipment

Description	Manufacture	Model Number	Last Cal Date	Cal Interval
Turntable and Mast Controller	EMCO	2090	N/A	N/A
Antenna Mast	EMCO	2075-2	N/A	N/A
Metal Top Turntable	EMCO	2081-2.03	N/A	N/A
Horn Antenna (1-18GHz)	EMCO	3115	01/23/2003	Annual
Bilog EMC Antenna (30-2000MHz)	Schaffner-Chase	CBL61112B	01/29/2003	Annual
3m Semi-Anechoic Chamber	EMC Test Systems	N/A	05/30/2000	2 yrs
Signal Generator	HP/Agilent	E4432B	03/01/2002	2 yrs
Spectrum Analyzer	HP/Agilent	8594E	04/23/2003	Annual
Spectrum Analyzer	HP/Agilent	8593E	06/30/2003	Annual
Coaxial Cable	Sucoflex	101PEA-498	01/21/2003	2 yrs
Coaxial Cable	Sucoflex	101PEA-417	01/21/2003	2 yrs
Amplifier 10-4200MHz	Mini-Circuits	ZHL-42W	N/A	N/A
Directional Coupler	Weinschel	1538RA-20	N/A	N/A
6 dB Attenuator	Hewlett-Packard	6dB	N/A	N/A
Desktop Computer	Dell Optiplex	GX110	N/A	N/A

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1.5. EQUIPMENT UNDER TEST DESCRIPTION

The E.U.T. is sold under the following trade name:

SignalReach CR100

The SignalReach™ CR100 Small Office Home Office (SOHO) Cellular Repeater extends cellular services into buildings, parking garages, tunnels and other poor coverage areas. The CR100 is designed for use with 800MHz cellular telephones and offers a cost-effective solution for small business and residential applications. The repeater is useful in areas where cellular service is available outside of the building but marginal indoors.

The SignalReach™ CR100 is a stationary device that automatically reradiates signals from the base transmitters without channel translation, for the purpose of improving reliability of existing service by increasing the signal strength in dead spots. This product is designed to operate with CDMA, TDMA, and AMPS signals from cellular service providers in the 824 to 894MHz cellular bands.

The repeater contains circuitry to ensure proper operating power levels, as well as including an automatic feedback and detection circuitry that detects poor isolation between the subscriber and donor antennae. In this condition the repeater will adjust it's gain to compensate for the abnormality, and warn the user through a visual indicator LED. The CR100 will enhance the cellular telephone user's experience while complying with cellular network specifications. Linear operation is guaranteed under all conditions.

The product has three RF coaxial connection interfaces, one to an external uplink antenna (not sold with the product) and the other two connect to external downlink antennas (not sold with the product); see [Functional Block Diagram](#). The repeater can be powered by its AC adapter or through the in-building primary subscriber antenna port using an optional power inserter. A green LED indicates when power is applied to the unit.

The CR100 allows up to two indoor antennas to be used without the need of external components. Its auxiliary indoor antenna port allows a second indoor zone to be easily connected.

1.6. GENERAL EQUIPMENT SPECIFICATION

1.6.1. POWER SUPPLY SPECIFICATIONS

Input Voltage: 12 Vdc
Input Current: 1 Amp max

1.6.2. UPLINK

Frequency Range: 824 – 849 MHz
Tunable Bands: Not Applicable
Necessary Bandwidth: Not Applicable
Type of Modulation: Not Applicable
Internal/External Data Source: Not Applicable
Emission Designator: DXW, F3E, F1D
Output Impedance: 50 Ohms
RF Power Output (rated): Single, leveled, up to 100 mWatts
Number of Channels: Not Applicable
Duty Cycle: Continuous, Linear Class A
Channel Spacing: Not Applicable
Band Selection: Duplexer

1.6.3. DOWNLINK

Frequency Range: 869 – 894 MHz
Tunable Bands: Not Applicable
Necessary Bandwidth: Not Applicable
Type of Modulation: Not Applicable
Local Oscillator: Not Applicable
Emission Designator: DXW, F3E, F1D
Output Impedance: 50 Ohms
RF Power Output (rated): Single/Dual; User Selectable; leveled; up to 30mW/port
Number of Channels: Not Applicable
Duty Cycle: Continuous, Linear Class A
Channel Spacing: Not Applicable
Band Selection: Duplexer
1st IF: Not Applicable
2nd IF: Not Applicable

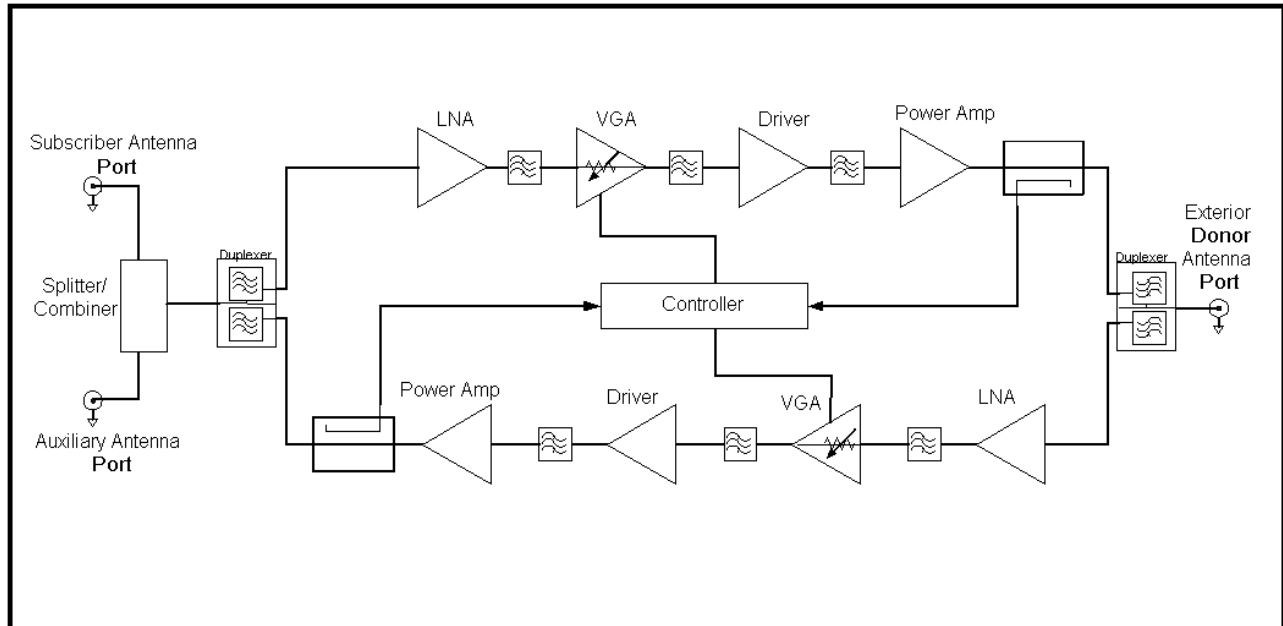
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1.6.4. EUT FUNCTIONAL BLOCK DIAGRAM

Equipment Under Test



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1.7. DEVIATIONS

The following deviations from, additions to, or exclusions from the test specifications have been made:

None

1.8. TEST SCHEDULE DESCRIPTION

Testing was performed using the procedures and requirements of CFR 47 Part 2 for type acceptance.

1.9. TEST RESULT SUMMARY

Testing was performed using procedures or criteria contained in the regulatory documents and standards specified below.

Results Summary

NAME OF TEST	FCC PARA. NO.	SPEC.	MEAS.	RESULT
RF Power Output	2.1046(a) 22.913(a)	Mobile spec; 7W ERP	0.091W	Complies
Emissions Limitations: AMPS/TDMA	2.1049(c) 22.917(d)	Mask	Plots	Complies
Emissions Limitation: CDMA	2.1049(c) 22.917(d)	Mask	Plots	Complies
Occupied Bandwidth: AMPS/TDMA/CDMA	N/A	N/A	Plots	N/A
Conducted Spurious Emission at Antenna Terminals	2.1051 22.917(d)	-13dBm	-17.2dBm,	Complies
Radiated Field Strength of Spurious Emissions	2.1053 22.917(d)	-13dBm	Plots, Tables	Complies
Frequency Tolerance	22.355	1.5ppm	N/A [2]	N/A [2]

Notes:

- [1] Since the EUT does not contain modulation circuitry, modulation testing was not performed.
- [2] Since the EUT is not designed to generate or translate frequencies, and only amplifies the signal it receives, frequency stability was not tested.

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1.9.1. RF POWER OUTPUT

Test Type:	RF Output Power
FCC Para No.:	2.1046, 22.913
Tested By:	Paul Eberling
Date:	January 13, 2004

1.9.1.1. SPECIFICATION REQUIREMENT:

According to § 22.913 (a); The ERP of mobile signal boosters must not exceed 7 watts.

1.9.1.2. MEASUREMENT PROCEDURE:

For transmitters other than SSB, ISB and controlled carrier radiotelephone, the power output shall be measured at the RF output terminals with electrical characteristics of the RF load attached.

The peak power at EUT antenna terminals is measured using an HP 8593E spectrum analyzer generator. See Appendix Figure A-1 for test set-up.

1.9.1.3. TEST RESULTS:

Complies

1.9.1.4. MEASUREMENT RESULTS

Up-Link RF Power Output

Port	Freq (MHz)	SA Reading (dBm)	Cable (dB)	Atten (dB)	Result (dBm)	EUT Output Power (Watts)	Limit (Watts)
Uplink Primary Port	825	19.6	Corrected	Corrected	19.6	0.091	7.0 ERP
	837	19.1	Corrected	Corrected	19.1	0.081	7.0 ERP
	848	16.5	Corrected	Corrected	16.5	0.045	7.0 ERP
Uplink Secondary Port	825	16.6	Corrected	Corrected	16.6	0.046	7.0 ERP
	837	15.9	Corrected	Corrected	15.9	0.039	7.0 ERP
	848	14.2	Corrected	Corrected	14.2	0.026	7.0 ERP

Note:

Attenuation of cable and attenuator is corrected automatically by spectrum analyzer correction function.

Down-Link RF Power Output

Port	Freq (MHz)	SA Reading (dBm)	Cable (dB)	Atten (dB)	Result (dBm)	EUT Output Power (Watts)	Limit (Watts) ERP
Dn-link	870	14.8	Corrected	Corrected	14.8	0.030	7.0

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Primary Port	881	15.0	Corrected	Corrected	15.0	0.032	7.0
	892	13.3	Corrected	Corrected	13.3	0.021	7.0
Dn-link Secondary Port	870	10.7	Corrected	Corrected	10.7	0.012	7.0
	881	13.1	Corrected	Corrected	13.1	0.020	7.0
	892	12.6	Corrected	Corrected	12.6	0.018	7.0

Note:

Attenuation of cable and attenuator is corrected automatically by spectrum analyzer correction function.

See Annex 1 for spectrum analyzer Plot Data.

1.9.2. EMISSIONS LIMITATION & OCCUPIED BANDWIDTH

1.9.2.1. EMISSIONS LIMITATION & OCCUPIED BANDWIDTH; AMPS/TDMA:

Test Type:	Emissions Limits for Cellular (AMPS/TDMA)
FCC Para No.:	2.1049, 22.917
Tested By:	Paul Eberling
Date:	January 13, 2004

1.9.2.2. SPECIFICATION REQUIREMENT:

According to §22.917 (d) For F1D emissions, the mean power of emissions must be attenuated below the mean power of the un-modulated carrier (P) as follows:

- (1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz: at least 26 dB;
- (2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz: at least 45 dB;
- (3) On any frequency removed from the carrier frequency by more than 90 kHz and up to the multiple of the carrier frequency, at least 60 dB or $43 + 10 \log (P)$ dB, whichever is the lesser attenuation.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean power radiated are equal to 0.5 percent of the total mean power radiated by the given emission.

1.9.2.3. MEASUREMENT PROCEDURE; AMPS/TDMA:

A single FM modulated tone was used to demonstrate its operability in AMPS and TDMA cell systems. A signal generator was setup to provide a CW tone modulated with a 2.5kHz and +/-5 kHz deviation signal. The signal generator output was verified on a spectrum analyzer as shown in Annex 2. The signal generator output was then connected to the EUT uplink and downlink ports respectively. See Appendix A, for test set-up.

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Input Signal Characteristics:

Agilent E4432B Signal Generator
Tone FM frequency: 2.5kHz
Deviation: ± 5 kHz.

Agilent Spectrum Analyzer Settings:

RBW: 1kHz
VBW: 300Hz
Span: 100 kHz
Sweep: 2 sec

1.9.2.4. TEST RESULTS:

Complies

1.9.2.5. MEASUREMENT RESULTS

See Annex 2 for Plot Data.

1.9.2.6. EMISSIONS LIMITATION & OCCUPIED BANDWIDTH; NADC:

Test Type:	Emissions Limits for Cellular (NADC)
FCC Para No.:	2.1049, 22.917
Tested By:	Paul Eberling
Date:	January 13, 2004

1.9.2.7. SPECIFICATION REQUIREMENT:

According to §22.917 (d) For F1D emissions, the mean power of emissions must be attenuated below the mean power of the un-modulated carrier (P) as follows:

- (4) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz: at least 26 dB;
- (5) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz: at least 45 dB;
- (6) On any frequency removed from the carrier frequency by more than 90 kHz and up to the multiple of the carrier frequency, at least 60 dB or $43 + 10 \log (P)$ dB, whichever is the lesser attenuation.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean power radiated are equal to 0.5 percent of the total mean power radiated by the given emission.

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1.9.2.8. MEASUREMENT PROCEDURE; NADC:

The signal generator was set up to simulate North American Digital Cellular (NADC) signaling with a $\pi/4$ DQPSK compliant modulation scheme. Input level was setup to achieve maximum EUT output power.

Agilent Spectrum Analyzer Settings:

RBW: 3kHz

VBW: 3kHz

Span: 50 kHz

Sweep: 1 sec

1.9.2.9. TEST RESULTS:

Complies

1.9.2.10. MEASUREMENT RESULTS

See Annex 2 for Plot Data.

1.9.2.11. EMISSIONS LIMITATION & OCCUPIED BANDWIDTH; CDMA:

Test Type:	Emissions Limits for Cellular (CDMA)
FCC Para No.:	2.1049, 22.917
Tested By:	Paul Eberling
Date:	January 13, 2004

1.9.2.12. SPECIFICATION REQUIREMENT:

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean power radiated are equal to 0.5 percent of the total mean power radiated by the given emission.

1.9.2.13. MEASUREMENT PROCEDURE; CDMA:

The signal generator was set up to simulate CDMA signaling with an IS-95 compliant modulation scheme. Input level was setup to achieve maximum EUT output power.

Agilent Spectrum Analyzer Settings:

RBW: 30kHz

VBW: 30kHz

Span: 2 MHz

Sweep: 1 sec

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1.9.2.14. TEST RESULTS:

Complies

1.9.2.15. MEASUREMENT RESULTS

See Annex 2 for Plot Data.

1.9.2.16. EMISSIONS LIMITATION & OCCUPIED BANDWIDTH; GSM:

Test Type:	Emissions Limits for Cellular (GSM)
FCC Para No.:	2.1049, 22.917
Tested By:	Paul Eberling
Date:	January 13, 2004

1.9.2.17. SPECIFICATION REQUIREMENT:

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean power radiated are equal to 0.5 percent of the total mean power radiated by the given emission.

1.9.2.18. MEASUREMENT PROCEDURE; GSM:

The signal generator was set up to simulate GSM signaling with an MSK compliant modulation scheme. Input level was setup to achieve maximum EUT output power.

Agilent Spectrum Analyzer Settings:

RBW: 30kHz

VBW: 30kHz

Span: 500 kHz

Sweep: 1 sec

Mask: Cell DXW

1.9.2.19. TEST RESULTS:

Complies

1.9.2.20. MEASUREMENT RESULTS

See Annex 2 for Plot Data.

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1.9.2.21. TWO-TONE INTERMODULATION TEST:

Test Type:	Intermodulation Distortion Test
FCC Para No.:	2.1051, 22.917
Tested By:	Paul Eberling
Date:	January 13, 2004

1.9.2.22. SPECIFICATION REQUIREMENT:

§ 2.1051 (e) *Out of band emissions.* The mean power of emissions must be attenuated below the mean power of the un-modulated carrier (P) on any frequency twice or more than twice the fundamental frequency by: at least $43 + 10 \log P$ dB.

Spur limit is defined in the following formula:

$$P_o - (43 + 10\log(P)) \quad [1]$$

1.9.2.23. MEASUREMENT PROCEDURE:

EUT was subjected to 2 simultaneous RF Carriers with the appropriate type of modulation. Two input signals are equal in level (and can be raised equally), were sent to the EUT. Input level was setup to achieve maximum EUT output power. The signal generator output was verified on a spectrum analyzer as shown in Annex 3. The signal generator output was then connected to the EUT uplink and downlink ports respectively. See Appendix A, for test set-up.

1.9.2.24. TEST RESULTS:

Complies

1.9.2.25. MEASUREMENT RESULTS

Up-Link IMD Results

Modulation	Freq Fc (MHz)	Channel	Result (dBm)	Limit Absolute (Watts)
NADC	824	LOW	<-13	-13
	837	MID	<-13	-13
	848	HIGH	<-13	-13
CDMA	824	LOW	<-13	-13
	837	MID	<-13	-13
	848	HIGH	<-13	-13

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Down-Link IMD Results

Modulation	Freq Fc (MHz)	Channel	Result (dBm)	Limit Absolute (Watts)
NADC	870	LOW	<-13	-13
	881	MID	<-13	-13
	892	HIGH	<-13	-13
CDMA	870	LOW	<-13	-13
	881	MID	<-13	-13
	892	HIGH	<-13	-13

See Annex 3 for Plot Data.

1.9.3. CONDUCTED SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Type:	Spurious Emissions at Antenna Terminals
FCC Para No.:	2.1051 (e) , 22.917 (d)
Tested By:	Paul Eberling
Date:	January 13, 2004

1.9.3.1. SPECIFICATION REQUIREMENT:

§ 2.1051 (e) *Out of band emissions.* The mean power of emissions must be attenuated below the mean power of the un-modulated carrier (P) on any frequency twice or more than twice the fundamental frequency by: at least 43+10 log P dB.

§22.917 (d) For F1D emissions, the mean power of emissions must be attenuated below the mean power of the un-modulated carrier (P) as follows:

- (1) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency, at least 60 dB or 43 + 10 log (P) dB, whichever is the lesser attenuation.

1.9.3.2. MEASUREMENT PROCEDURE:

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminal when properly loaded with a suitable artificial antenna.

EUT was subjected to an RF modulated carrier with the appropriate type of modulation. Input level was setup to achieve maximum EUT output power. For each uplink and

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downlink test the signal generator output was connected to the EUT uplink and downlink ports respectively. Sufficient scans were taken to show any out of band emissions up to 10th harmonic. See Appendix A, for test set-up.

Spur limit is defined in the following formula:

$$P_o - (43 + 10\log P) \quad [1]$$

Using the measured values the limit is calculated below:

$$19.6 - [43 + 10\log(0.091)] = -13.0 \quad [2]$$

The test data presented in this section is the worst case test configuration, EUT operating with CDMA modulation. This was determined by scanning the EUT operating in all different modulation schemes (CW, TDMA, CDMA, GSM, F1D, F3E).

1.9.3.3. TEST RESULTS:

Complies

1.9.3.4. MEASUREMENT RESULTS

All emissions were 20 dB below required limit (-13.0 dBm). See Annex 3 for Plot Data.

1.9.4. RADIATED FIELD STRENGTH OF SPURIOUS EMISSIONS

Test Type:	Emissions Limits for Cellular
FCC Para No.:	2.1053, 22.917
Tested By:	Paul Eberling
Date:	January 13, 2004

1.9.4.1. SPECIFICATION REQUIREMENT:

The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least $43 + 10 \log P$. This is equivalent to -13 dBm absolute power.

1.9.4.2. MEASUREMENT PROCEDURE:

Measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal condition of installation and power.

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The EUT is placed in a 3-meter semi anechoic chamber on a wooden table resting on the metal turntable. The EUT is stimulated by a suitably modulated signal from a signal generator at three discrete frequencies for each mode of operation. More specifically, 824, 836 and 849 MHz respectively for the uplink frequency band and 869, 881 and 894 MHz respectively for the downlink band. Measurements were performed with full RF output and modulation.

The equivalent power into a dipole antenna was determined from the field intensity levels measured at 3 meters using the substitution method. The EUT's radiated field strength emissions is measured from 30MHz to the 10th harmonic of the radiated fundamental signal. Through turntable rotation (360 degrees), antenna orientation (V and H) and antenna height (1 to 4 meters) the highest emission level is located. The EUT is then replaced with a signal generator and dipole antenna so that it produces a known signal strength at a given distance. The signal generator output is increased until the amplitude of the radiated signal equals that obtained from the EUT. The frequency range up to the tenth harmonic of the fundamental frequency was investigated. The absolute levels of the spurious emissions were measured by the substitution. Using the measured values the limit is calculated below:

$$\text{Rcv Power (dB)} = \text{Tx Power (dB)} - \text{Cable Atten (dB)} + \text{Tx Ant Gain (dB)} \quad [3]$$

Spurious emissions in dB is shown below:

$$\text{Emission(dB)} = 10 \text{ Log (Po Watts/0.001)} - \text{absolute level (dB)} \quad [4]$$

Spurious attenuation limit in dB is shown below:

$$\text{Limit(dB)} = 43 + 10 \text{ Log (Po Watts)} \quad [5]$$

1.9.4.3. TEST RESULTS:

Complies

1.9.4.4. MEASUREMENT RESULTS

All emissions were 20 dB below required limit (-13.0 dBm). See Annex 4 for Plot Data.

1.9.5. RF EXPOSURE

Test Type:	Maximum Permissible Exposure
FCC Para No.:	1.1310, 2.1093
Tested By:	Paul Eberling
Date:	January 13, 2004

1.9.5.1. SPECIFICATION REQUIREMENT:

As per FCC 47CFR§1.1301; FCC OET Bulletin 65, 97-01 "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" and FCC OET Bulletin 65, Supplement C, 01-01, "Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", for transmitters operating in the 824-849 MHz range, paragraph 1.1310 Table 1 limits maximum permissible exposure (MPE) to $f/1500$ mW/cm² for uncontrolled environments and $f/300$ mW/cm² for controlled environments.

The far field on-axis power flux density (W/m²) is calculated using the following formula:

$$S = G P_T / 4\pi R^2 \quad [6]$$

Where:

- S = Power density (in appropriate units, e.g. mW/cm²)
- G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
- P_T = Power input to the antenna (in appropriate units, e.g., mW)
- R = Distance to the center of radiation of the antenna (appropriate units, e.g., cm)

It is important to note that the power gain factor, **G**, in Equation (1) is normally **numeric** gain. Therefore, when power gain is expressed in logarithmic terms, i.e., dB, a conversion is required using the relation:

$$G=10^{(dB/10)} \quad [7]$$

For example, a logarithmic power gain of 14 dB is equal to a numeric gain of 25.12.

1.9.5.2. CR100 CELLULAR SIGNAL AMPLIFIER PARTICULARS

The following table shows the maximum downlink output power of the signal amplifier combined with an antenna with 9dBi gain. This is the maximum antenna gain permissible for the downlink signal as documented in the user/installation manual. The following table also shows the maximum uplink output power of the signal amplifier combined with an antenna with 18dBi gain. This is the maximum antenna gain permissible for the downlink signal as documented in the user/installation manual. The resulting radiated power density is compared to MPE limits for both uncontrolled and controlled environments.

Applicant: Arrista Technologies Inc.

Equipment: CR100 Bi-Directional Cellular Signal Amplifier

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1.9.5.3. UP LINK (824-849MHz)

Uplink MPE Calculations

Output power of the amplifier:	0.09 W maximum	
Antenna Gain: Maximum antenna gain allowed as described in user/installation manual.	Isotropic Gain = 9 dBi Numerical Gain = 7.94	
Operational Frequency:	824-849MHz	
Minimum distance (Controlled): From radiating source for personnel aware of radiofrequency equipment and who are able to limit their exposure time. (Installation Technicians)	20cm Antenna mounted in building interior	
Minimum distance (Uncontrolled): From radiating source for personnel unaware of radiofrequency equipment and who are not able to limit their exposure time. (General Public)	20cm Antenna mounted in building interior	
Calculated RF Power Density:	0.142 mW/cm ²	
Maximum Permissible Exposure (MPE):	Controlled 6 min avg exposure 2.75mW/cm ²	Uncontrolled 30 min avg exposure 0.55mW/ cm ²

1.9.5.4. TEST RESULTS:

Complies

1.9.5.5. CALCULATIONS

$$S = G P_T / 4\pi R^2 \quad [8]$$

$$S = (7.94 * .09 * 10^3) / (4\pi * 20^2)$$

$$S = 714.6 / (1600\pi)$$

$$S = 0.142 \text{ mW/cm}^2$$

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Equipment: CR100 Bi-Directional Cellular Signal Amplifier

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1.9.5.6. DOWN LINK (869-894MHz)

Downlink MPE Calculations

Output power of the amplifier:	0.032 W maximum	
Antenna Gain: Maximum antenna gain allowed as described in user/installation manual.	Isotropic Gain = 18 dBi Numerical Gain = 63.1	
Operational Frequency:	824-849MHz	
Minimum distance (Controlled): From radiating source for personnel aware of radiofrequency equipment and who are able to limit their exposure time. (Installation Technicians)	50cm Antenna mounted on building exterior	
Minimum distance (Uncontrolled): From radiating source for personnel unaware of radiofrequency equipment and who are not able to limit their exposure time. (General Public)	50cm Antenna mounted on building exterior	
Calculated RF Power Density:	0.064 mW/cm ²	
Maximum Permissible Exposure (MPE):	Controlled 6 min avg exposure 2.90mW/cm ²	Uncontrolled 30 min avg exposure 0.58mW/ cm ²

1.9.5.7. TEST RESULTS:

Complies

1.9.5.8. CALCULATIONS

$$S = G P_T / 4\pi R^2 \quad [9]$$

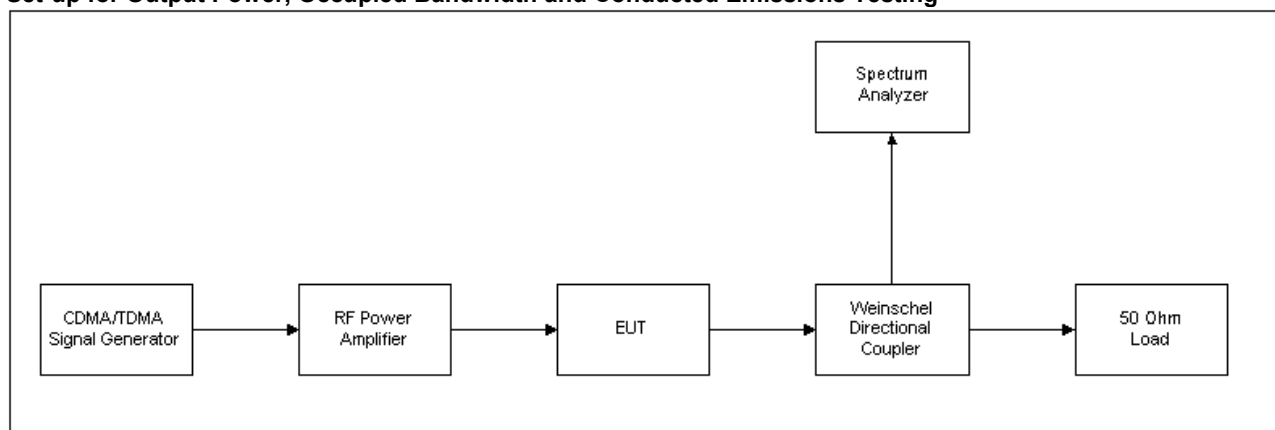
$$S = (63.1 * .032 * 10^3) / (4\pi * 50^2)$$

$$S = 2019 / (10000\pi)$$

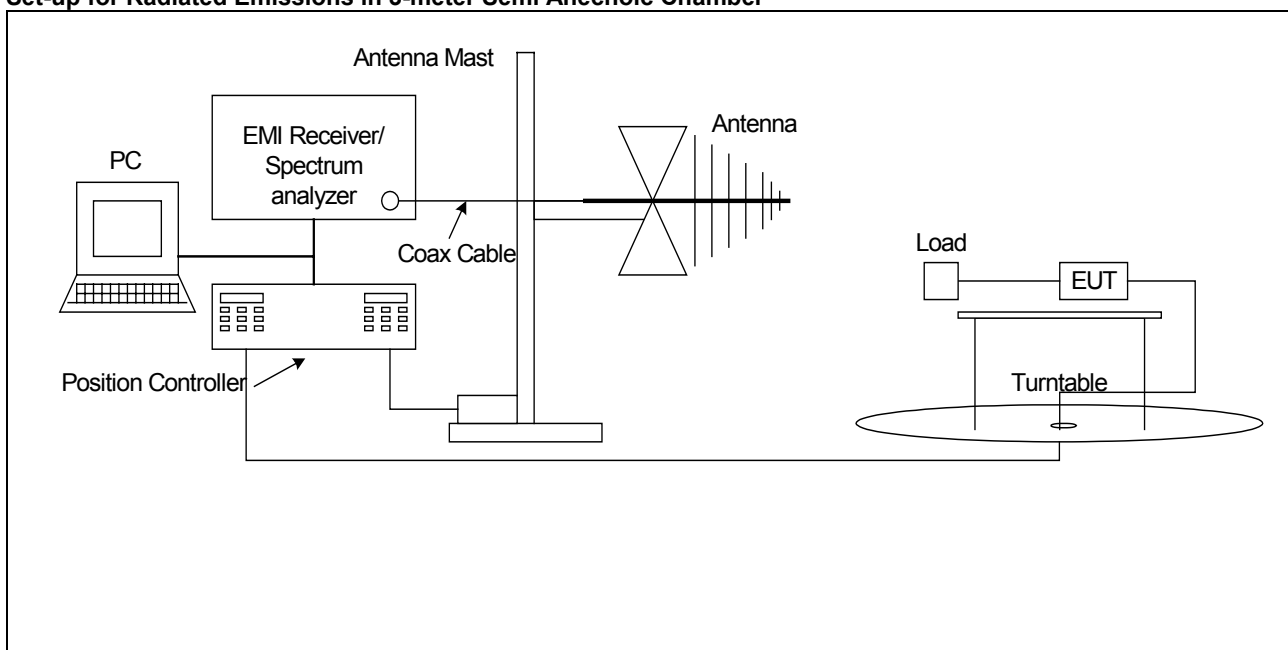
$$S = 0.064 \text{ mW/cm}^2$$

2. APPENDIX A: TEST SET-UP DIAGRAMS

Set-up for Output Power, Occupied Bandwidth and Conducted Emissions Testing



Set-up for Radiated Emissions in 3-meter Semi Anechoic Chamber



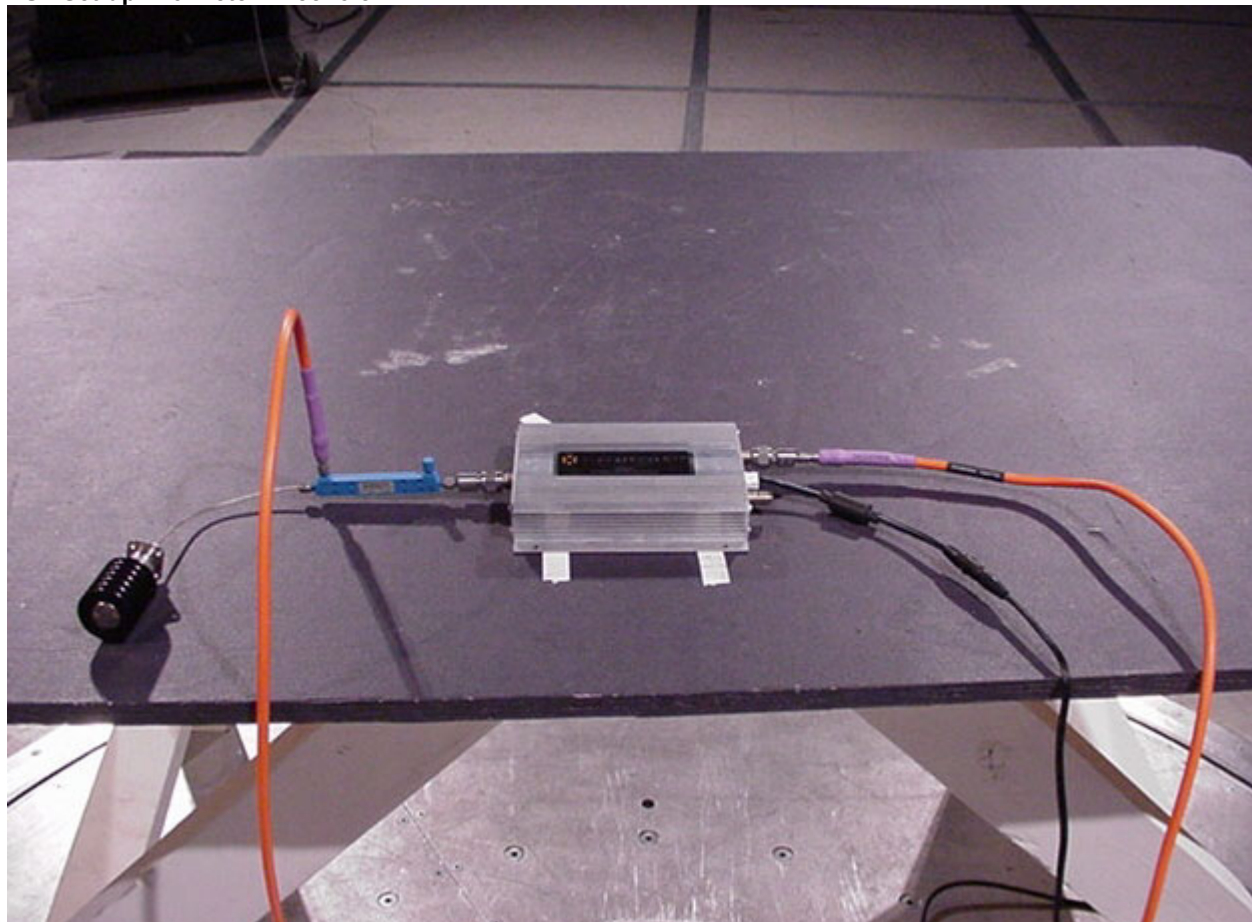
Applicant: Arrista Technologies Inc.

Equipment: CR100 Bi-Directional Cellular Signal Amplifier

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3. APPENDIX B: PICTURES OF EUT

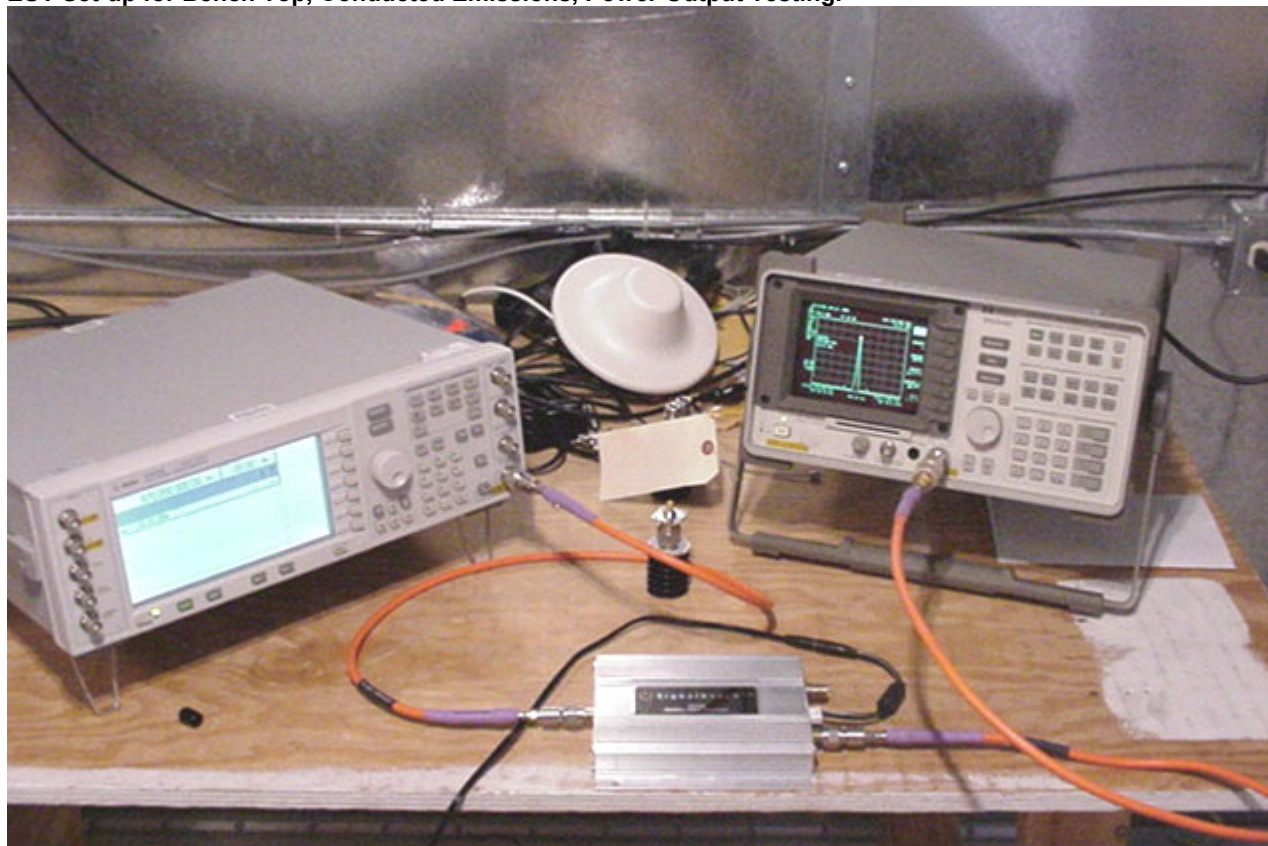
EUT Set-up in 3-meter Anechoic



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EUT Set-up for Bench Top, Conducted Emissions, Power Output Testing.



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