



Report No	ED0658-1
Client	Airvana 25 Industrial Ave. Chelmsford, MA 01824
Phone	978-250-3028
Fax	978-250-3910
FRN	0007380173
Model	800002
FCC ID	QHY800002-1
Equipment Type Equipment Code	Licensed base station for Part 24 PCB
Results	As detailed within this report
Prepared by	 Evan Gould – Test Engineer
Authorized by	 Michael Buchholz – EMC Manager
Issue Date	9/5/03
Conditions of issue	This Test Report is issued subject to the conditions stated in ‘terms and conditions’ section of this report.

Curtis-Straus LLC is accredited by the American Association for Laboratory Accreditation for the specific scope of accreditation under Certificate Number 1627-01. This report may contain data which is not covered by the A2LA accreditation.

## Table Of Contents

<i>Summary</i> .....	3
<i>Test Methodology</i> .....	3
<i>Statement of Conformity</i> .....	4
<i>Conducted Peak Output Power</i> .....	5
<i>Conducted Spurious and Band Edges</i> .....	6
<i>Radiated Spurious Emissions</i> .....	7
<i>Frequency Stability</i> .....	8
<i>Bandwidth Measurements</i> .....	9
<i>Test Equipment Used</i> .....	12
<i>Terms And Conditions</i> .....	13
<i>A2LA Accreditation</i> .....	15

## Summary

This technical report supports an application for certification of a transmitter operating pursuant to 47 CFR 24 Subpart E – Broadband PCS. The product is the RM-1900 Radio Module card (model #: 800002), which is used in conjunction with the RN 8000 base station. This product has been certified before under the FCC ID: QHY800002. The product was modified as follows:

*The local oscillator (synthesizer) that provides the final upconversion to the RF transmit frequency was modified to improve (decrease) close-in phase noise. This was done by adding/changing component values in the synthesizer loop filter to decrease its bandwidth and reduce its self-noise generation.*

The new proposed FCC ID is QHY800002-1

## Test Methodology

Radiated emissions testing is performed according to the procedures specified in ANSI C63.4 (2000).

Frequency Range Investigated	Measurement Distance
30-1000MHz	3m
1-18GHz	3m
18-20GHz	1m

The EUT's power level was set to it's maximum value of 43dBm.

Radiated spurious emissions was performed with the (male N-type) antenna port terminated. The product was rotated around the vertical axis with the door closed.

## Statement of Conformity

Part 2	Part 15	Comments
2.925		The label is shown in the label exhibit. It is attached to the side of the Radio Module and is visible during installation.
2.1033(c)(5)		EUT operates in the frequency range 1931.25-1988.75MHz (Channels 25-1175; See attached Channel Plan)
2.1033(c)(8)		The power into the RF power amplifier is in the range 24Vdc - 30Vdc and should not exceed 16A.
2.1033(c)(9)		Output level is set via software up to the value at which the report data was taken. Airvana indicates this device has no tune-up procedure but output is verified after installation via a PA offset calibration.
2.1046	24.232	The EUT meets the peak output power limit specified in 24.232.
2.1049		Measurements were taken of the Occupied (99%) Bandwidth.
2.1055	24.235	Frequency stability with regard to temperature and voltage variations is sufficient to ensure that the fundamental emission will stay within the authorized frequency block.
2.1051	24.238	All spurious emissions outside the authorized frequency block meet the limit specified in 24.238.
		See the attached manual exhibit with RF exposure warnings on pages 45 and 87.

## Conducted Peak Output Power

### LIMIT

"In no case may the peak output power of a base station transmitter exceed 100 watts." [24.232(a)]

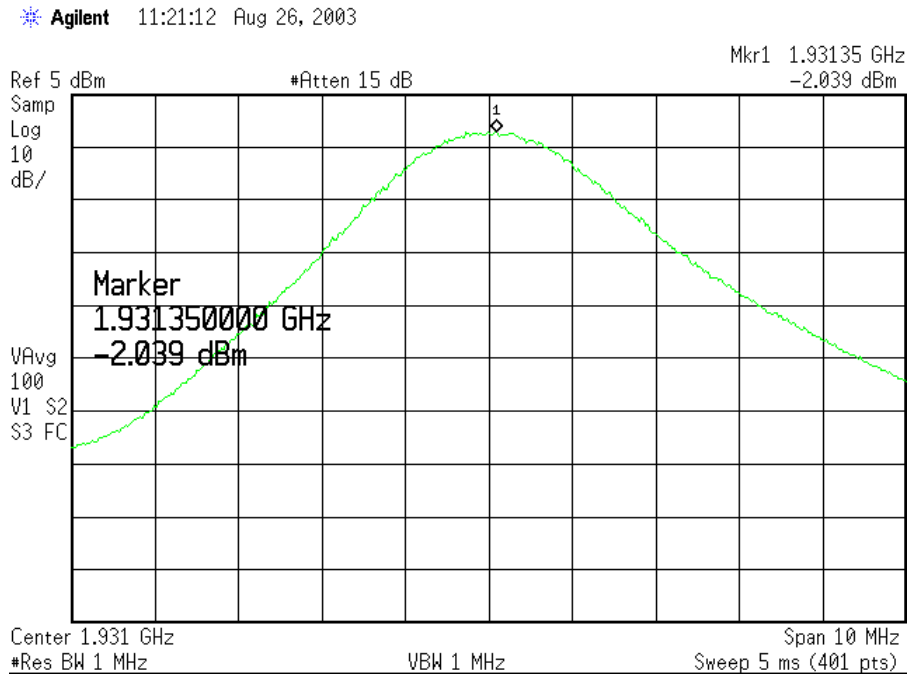
"The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power." [24.238(d)]

### MEASUREMENTS

Peak Output Power (Conducted)							Curtis Straus LLC		
Date: 26-Aug-03		Engineer: Evan Gould			Work Order: D0658				
Company: Airvana		EUT: RM-1900			Fundamental Frequency: 1.93-1.99GHz				
Test Site: "M"		Cable: 142LL #3			Analyzer: Orange				
Attenuator #1: PE7004-20		Attenuator #2: PE7019-20							
Measurement Type: Average				Resolution BW: 1MHz				Video BW: 1MHz	
Notes:									
Channel Number	Frequency (MHz)	Reading (dBm)	Cable Factor (dB)	Attenuator #1 Factor (dB)	Attenuator #2 Factor (dB)	Adjusted Reading (dBm)	47 CFR 24.232(a)		
							100W Limit (dBm)	Margin (dB)	Result (Pass/Fail)
25 (lowest)	1931.25	-2.039	1.9	20.1	19.8	39.8	50.0	-10.2	Pass
600 (middle)	1960.00	-1.763	1.9	20.1	19.8	40.0	50.0	-10.0	Pass
1175 (highest)	1988.75	-3.566	1.9	20.1	19.8	38.2	50.0	-11.8	Pass

### SAMPLE ANALYZER PLOT

#### Channel 25



## Conducted Spurious and Band Edges

### LIMIT

“On any frequency outside a licensee’s frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB.” [24.238(a)]

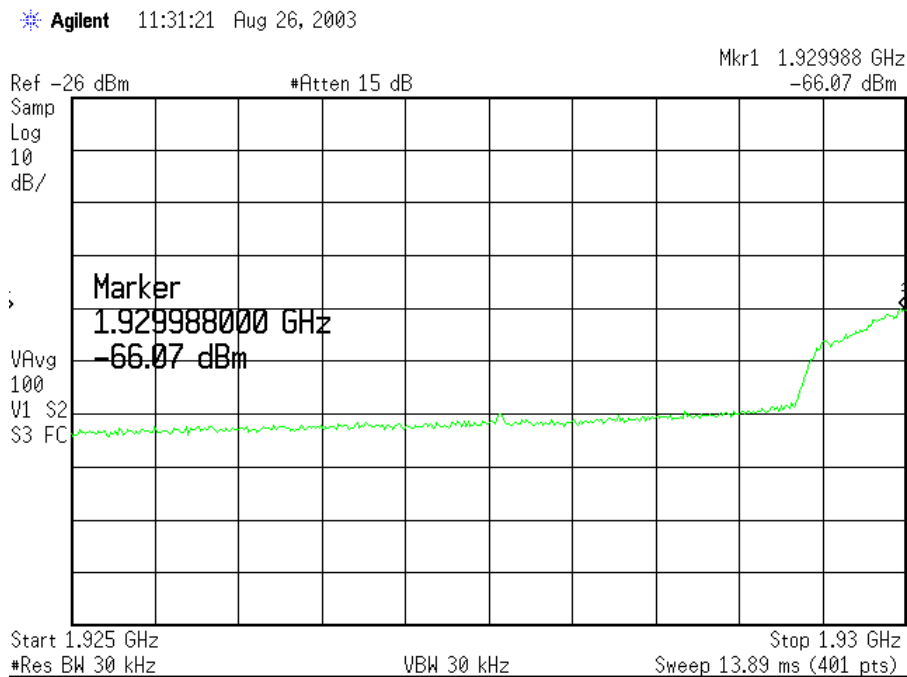
“...in the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the (-26dB) emission bandwidth...may be employed.” [24.238(b)]

### MEASUREMENTS

Band Edges (Conducted)							Curtis-Straus LLC		
Date: 26-Aug-03		Engineer: Evan Gould			Work Order: D0658				
Company: Airvana		EUT: RM-1900			Fundamental Frequency: 1.93-1.99GHz				
Test Site: "M"		Cable: 142LL #3			Analyzer: Orange				
Attenuator #1: PE7004-20		Attenuator #2: PE7019-20							
Measurement Type: Average				Resolution BW: 30kHz (See Notes)					
				Video BW: 30kHz					
Notes: Measured -26dB Bandwidth = 1.4MHz									
Channel Number	Frequency (MHz)	Reading (dBm)	Cable Factor (dB)	Attenuator #1 Factor (dB)	Attenuator #2 Factor (dB)	Adjusted Reading (dBm)	47 CFR 24.238(a)		
							Limit (dBm)	Margin (dB)	Result (Pass/Fail)
Low Band Edge 25 (lowest)	1930.00	-66.070	1.9	20.1	19.8	-24.3	-13.0	-11.3	Pass
High Band Edge 1175 (highest)	1990.00	-67.310	1.9	20.1	19.8	-25.5	-13.0	-12.5	Pass

No spurious conducted emissions were detected in the range 30MHz – 20GHz.

### SAMPLE ANALYZER PLOT



## Radiated Spurious Emissions

### LIMITS

“On any frequency outside a licensee’s frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB.” [24.238(a)]

### MEASUREMENTS

Radiated Emissions Table								Curtis-Straus LLC		
Date: 27-Aug-03			Company: Airvana			Table: 3				
Engineer: Evan Gould			EUT Desc: RM-1900			Work Order: D0658				
Frequency Range: 30MHz - 20GHz					Measurement Distance: 3 m					
Notes: Since there are no emissions within 30dB of the limit, substitution method was not implemented.								Test Site: "M"		
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Field Strength (dBµV/m)	EIRP (dBm)	47 CFR 24.238(a)		
								Limit (dBm)	Margin (dB)	Result (Pass/Fail)
noise floor	495.3	29.7	20.7	17.7	3.4	30.1	-65.1	-13.0	-52.1	Pass
noise floor	967.2	29.1	20.0	24.0	5.2	38.3	-66.9	-13.0	-53.9	Pass
Hav	2426.3	38.3	24.4	32.0	2.1	48.0	-47.2	-13.0	-34.2	Pass
Hav	1200.0	35.2	22.0	28.2	1.5	42.9	-52.3	-13.0	-39.3	Pass
Hav	13400.0	22.0	20.7	43.0	5.5	49.8	-45.4	-13.0	-32.4	Pass
noise floor (1m)	18925.0	16.9	21.2	40.1	7.5	43.3	-61.4	-13.0	-48.4	Pass
30-1000MHz >>			Pre-Amp: Black		Cable: 65 ft RG8A/U		Analyzer: White	Antenna: Blue		
1-18GHz >>			Pre-Amp: Or-Blk		Cable: 142LL #3		Analyzer: Orange	Antenna: Yellow Horn		
18-20GHz >>			Pre-Amp: 18-26.5GHz		Cable: 142LL #3		Analyzer: Orange	Antenna: White Horn		

### Frequency Stability

#### REQUIREMENT

"The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block." [24.235]

#### MEASUREMENTS

Frequency Stability vs. Temperature & Voltage Variation					CFR 24.235
Date: 8/28/2003		Company: Airvana		Work Order: D0658	
Engineer: Mairaj Hussain		EUT: BTS		Site: Airvana's lab	
Analyzer: Orange		Fluke DVM		Huger Enviromental meter	
Channel: 25		Center Frequency: 1931.25 MHz			
Temp	Readng #1 MHz	Readng #2 MHz	Readng #3 MHz	Readng #4 MHz	Readng #5 MHz
-30	1930.5766	1930.5765	1930.5766	1930.5767	1930.5767
<b>Delta</b>	-0.0001	0.0001	0	-0.0001	-0.0002
-20	1930.5711	1930.571	1930.5709	1930.5765	1930.5766
<b>Delta</b>	0.0054	0.0056	0	-0.0001	-0.0001
-10	1930.5733	1930.5732	1930.583	1930.5682	1930.5731
<b>Delta</b>	0.0032	0.0034	-0.0064	0.0084	0.0034
0	1930.5786	1930.5731	1930.5786	1930.5785	1930.5732
<b>Delta</b>	-0.0021	0.0035	-0.002	-0.0019	0.0033
10	1930.5766	1930.5814	1930.571	1930.566	1930.571
	-0.0001	-0.0048	0.0056	0.0106	0.0055
20					
22.95V	1930.5765	1930.5765	1930.5766	1930.5765	1930.5766
<b>20</b>	Nominal	Nominal	Nominal	Nominal	Nominal
<b>27V</b>	<b>1930.5765</b>	<b>1930.5766</b>	<b>1930.5766</b>	<b>1930.5766</b>	<b>1930.5765</b>
20					
29.9V	1930.5711	1930.571	1930.571	1930.5767	1930.5766
<b>Delta</b>	0.0054	0	0.0056	-1E-04	-0.0001
30	1930.5709	1930.5711	1930.571	1930.5711	1930.571
<b>Delta</b>	0.0056	0.0055	0.0056	0.0055	0.0055
40	1930.5813	1930.5814	1930.5814	1930.5814	1930.5813
<b>Delta</b>	-0.0048	-0.0048	-0.0048	-0.0048	-0.0048
50	1930.571	1930.5711	1930.57909	1930.5765	1930.5766
<b>Delta</b>	0.0055	0.0055	-0.00249	0.0001	-0.0001
Note: EUT's protection circuitry does not all operation above 29.9V.					

The fundamental frequency did not stray from its authorized frequency block throughout the entire stability test.



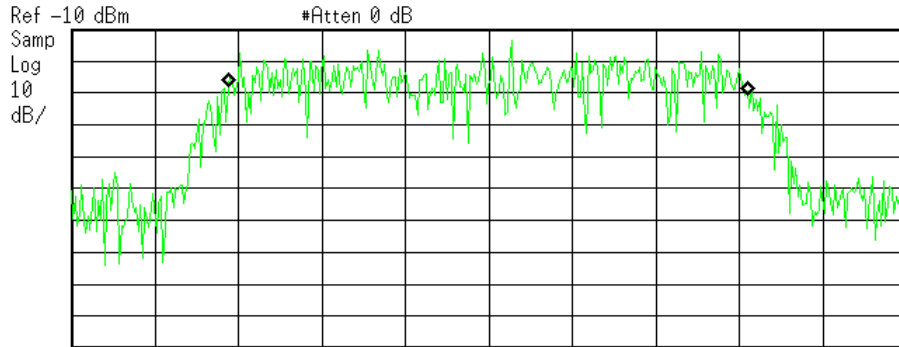


# Bandwidth Measurements

## ANALYZER PLOTS

### Channel 25 Occupied Bandwidth

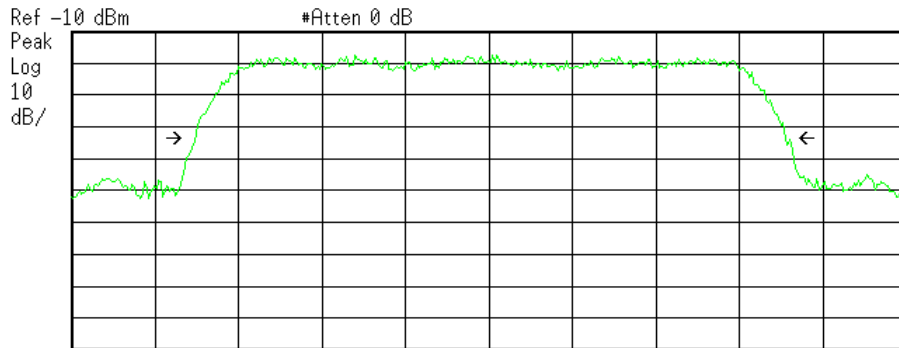
Agilent 10:24:57 Aug 26, 2003



Center 1.931 GHz		Span 2 MHz	
#Res BW 10 kHz	#VBW 100 kHz	Sweep 43.48 ms (401 pts)	
Occupied Bandwidth Results (idle)			
<b>Occupied Bandwidth</b>	<b>Occ BW % Pwr</b>	99.00 %	
1.246 MHz			
<b>Transmit Freq Error</b>	-1.689 kHz		

### Channel 25 -26dB Bandwidth

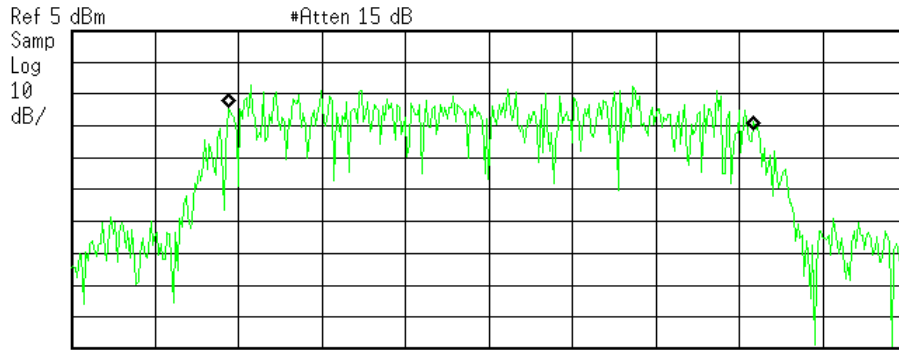
Agilent 10:30:27 Aug 26, 2003



Center 1.931 GHz		Span 2 MHz	
#Res BW 10 kHz	#VBW 100 kHz	Sweep 43.48 ms (401 pts)	
Emission Bandwidth Results (paused)			
<b>Emission Bandwidth</b>	<b>Emiss BW X dB</b>	-26.0 dB	
1.413 MHz			

### Channel 600 Occupied Bandwidth

Agilent 11:39:43 Aug 26, 2003

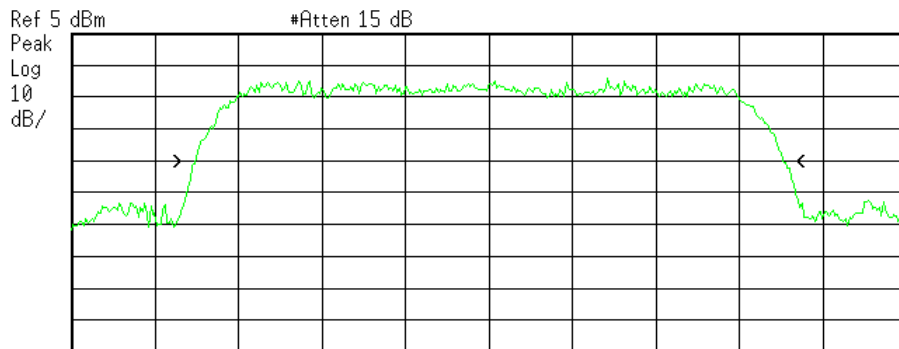


Center 1.96 GHz Span 2 MHz  
#Res BW 10 kHz #VBW 100 kHz Sweep 43.48 ms (401 pts)

Occupied Bandwidth Results (idle)	
Occupied Bandwidth	Occ BW % Pwr 99.00 %
1.257 MHz	
Transmit Freq Error	4.139 kHz

### Channel 600 -26dB Bandwidth

Agilent 11:40:42 Aug 26, 2003

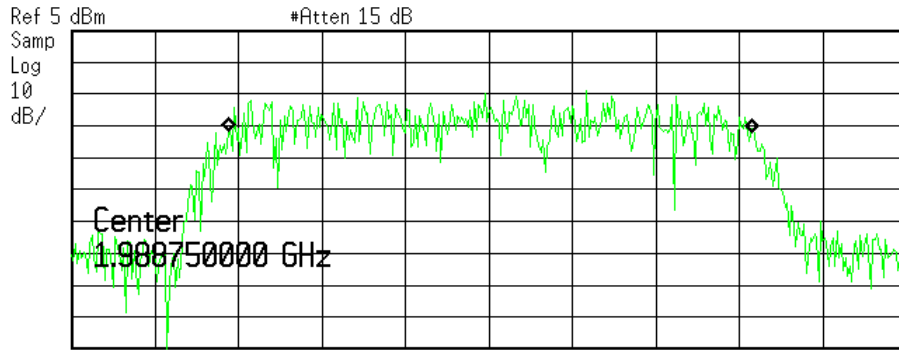


Center 1.96 GHz Span 2 MHz  
#Res BW 10 kHz #VBW 100 kHz Sweep 43.48 ms (401 pts)

Emission Bandwidth Results (paused)	
Emission Bandwidth	Emiss BW X dB -26.0 dB
1.409 MHz	

### Channel 1175 Occupied Bandwidth

Agilent 13:20:23 Aug 26, 2003

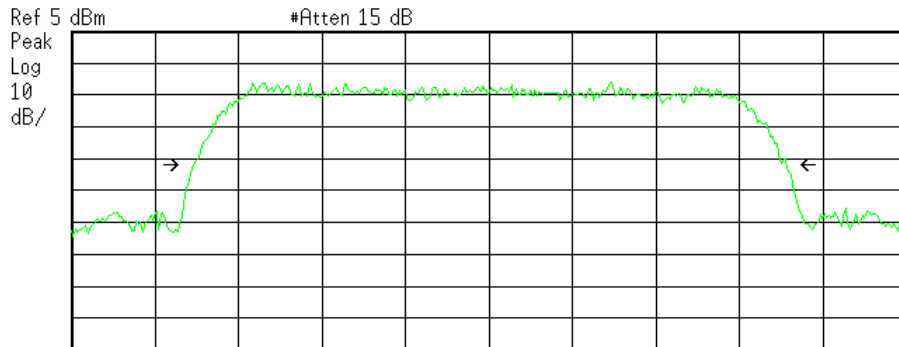


Center 1.989 GHz Span 2 MHz  
#Res BW 10 kHz #VBW 100 kHz Sweep 43.48 ms (401 pts)

Occupied Bandwidth Results (idle)	
Occupied Bandwidth	Occ BW % Pwr 99.00 %
1.251 MHz	
Transmit Freq Error	2.711 kHz

### Channel 1175 -26dB Bandwidth

Agilent 13:21:27 Aug 26, 2003



Center 1.989 GHz Span 2 MHz  
#Res BW 10 kHz #VBW 100 kHz Sweep 43.48 ms (401 pts)

Emission Bandwidth Results (paused)	
Emission Bandwidth	Emiss BW X dB -26.0 dB
1.421 MHz	



## Test Equipment Used

REV. 8/20/03

<b>SPECTRUM ANALYZERS</b>	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
WHITE	9kHz-22GHz	8593E	HP	3547U01252	00022	25-FEB-2004
ORANGE	9kHz-26.5GHz	E4407B	HP	US39440975	00394	27-JUN-2004

<b>OPEN AREA TEST SITE (OATS)</b>	FCC CODE	IC CODE	VCCI CODE	CALIBRATION DUE
SITE M	93448	IC 2762-M	R-904	25-MAR-2005

<b>ANTENNAS</b>	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
BLUE BILOG	30MHz-1GHz	3143	EMCO	1271	00803	17-MAR-2005
YELLOW HORN	1-18GHz	3115	EMCO	9608-4898	00037	22-MAY-2005
HF (WHITE) HORN	18-26.5GHz	801-WLM	WAVELINE	00758	00758	15-JUL-2005

<b>PREAMPS / ATTENUATORS</b>	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
BLACK	0.01-2000MHz	ZFL-1000-LN	C-S	N/A	00799	17-MAR-2004
ORANGE-BLACK	1-20GHz	SMC-12A	C-S	637367	00761	29-JUL-2004
HF (YELLOW)	18-26.5GHz	AFS4-18002650-60-8P-4	C-S	467559	00758	15-JUL-2004
HF 20DB ATTENUATOR	0.03-20 GHz	PE 7019-20	PASTERNAK	01	00791	21-MAY-2005

<b>FREQUENCY COUNTER</b>	MN	MFR	SN	ASSET	CALIBRATION DUE
5340A	HP5340A	HP	1440A02320	00787	30-JUL-2004

<b>RMS VOLTMETER</b>	MN	MNFR	SN	ASSET	CALIBRATION DUE
TRUE-RMS VOLTMETER	79III	FLUKE	71700298	00769	03-OCT-2003

<b>METEOROLOGICAL METERS</b>	MN	MFR	SN	ASSET	CALIBRATION DUE
TEMPERATURE /HUMIDITY GAUGE	THG-912	HUGER	4000562	00789	08-NOV-2003

Unless otherwise noted the calibration interval is one year. All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

## Terms And Conditions

### Paragraph 1. SERVICES. LABORATORY will:

- 1.1 Use the degree of care and skill ordinarily exercised by and consistent with the standards of the profession.
- 1.2 Perform all technical services in substantial accordance with the generally accepted laboratory principles and practices.
- 1.3 Retain all pertinent records relating to the services performed for a period of three (3) years following submission of the report describing such services, during which period the records will be made available to CLIENT upon reasonable request.

### Paragraph 2. CLIENT'S RESPONSIBILITIES. CLIENT or his authorized representative will:

- 2.1 Provide LABORATORY with all plans, schematics, specifications, addenda, change orders, drawings and other information for the proper performance of technical services.
- 2.2 Designate a person to act as CLIENT's representative with respect to LABORATORY's services to be performed on behalf of the CLIENT; such person or firm to have complete authority to transmit instructions, receive information and data, interpret and define CLIENT's policies and decisions with respect to the LABORATORY's work on behalf of the CLIENT and to order, at CLIENT's expense, such technical services as may be required.
- 2.3 Designate a person who is authorized to receive copies of LABORATORY's reports.
- 2.4 Undertake the following:
  - (a) Secure and deliver to LABORATORY, without cost to LABORATORY, preliminary representative samples of the equipment proposed to require technical services, together with any relevant data.
  - (b) Furnish such labor and equipment needed by LABORATORY to handle samples at the LABORATORY and to facilitate the specified technical services.

### Paragraph 3. GENERAL CONDITIONS:

- 3.1 LABORATORY, by the performance of services covered hereunder, does not in any way assume any of those duties or responsibilities customarily vested in the CLIENT, its employees, or any other party, agency or authority.
- 3.2 LABORATORY shall not be responsible for acts of omissions of any other party or parties involved in the design, manufacture or maintenance of the equipment or the failure of any employee, contractor or subcontractor to undertake any aspect of equipment's design, manufacture or maintenance.
- 3.3 LABORATORY is not authorized to revoke, alter, release, enlarge or release any requirement of the equipment's design, manufacture or maintenance unless specifically authorized by CLIENT or his authorized representative.
- 3.4 THE ONLY WARRANTY MADE BY LABORATORY IN CONNECTION WITH ITS SERVICE PERFORMED HEREUNDER IS THAT IT WILL USE THAT DEGREE OF CARE AND SKILL AS SET FORTH IN PARAGRAPH 1 ABOVE. NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS MADE OR INTENDED FOR SERVICES PROVIDED HEREUNDER.
- 3.5 Where the LABORATORY indicates that additional testing is advisable to obtain more valid or useful data, and where such testing has not been authorized, CLIENT agrees to view such test reports as inconclusive and preliminary.
- 3.6 The LABORATORY will supply technical service and prepare a report based solely on the sample submitted to the LABORATORY by the CLIENT. The CLIENT understands that application of the data to other devices is highly speculative and should be applied with extreme caution.
- 3.7 The LABORATORY agrees to exercise ordinary care in receiving, preserving and shipping (F.O.B. Littleton, MA) any sample to be tested, but assumes no responsibility for damages, either direct or consequential, which arise from loss, damage or destruction of the samples due to the act of examination, modification or testing, or technical services or circumstances beyond LABORATORY's control.
- 3.8 The LABORATORY will hold samples for thirty (30) days after tests are completed, or until the CLIENT's outstanding debts to the LABORATORY are satisfied, whichever is later.
- 3.9 The CLIENT recognizes that generally accepted error variances apply and agrees to consider such error variances in its use of test data.
- 3.10 It is agreed between LABORATORY and CLIENT that no distribution of any tests, reports or analysis other than that described below shall be made to any third party without the prior written consent of both parties unless such distribution is mandated by operation of law. It is agreed that tests, reports, or analysis results may be disclosed to third party auditors of the laboratory at the laboratory facility in the course of accreditation maintenance audits. No reference to reports or technical services of the LABORATORY shall be made in any advertising or promotional literature without the express written permission of the LABORATORY.
- 3.11 The CLIENT acknowledges that all employees of LABORATORY operate under employment contracts with the LABORATORY and CLIENT agrees not to solicit employment of such employees or to solicit information related to other clients from said employees.
- 3.12 In recognition of the relative risks and benefits of the project to both CLIENT and LABORATORY, the risks have been allocated such that the CLIENT agrees, to the fullest extent permitted by law, to limit the liability of the LABORATORY to the CLIENT for any and all claims, losses, costs, damages of any nature whatsoever or claims expenses from any cause or causes, including attorneys' fees and costs and expert witness fees and costs, so that the total aggregate liability of the LABORATORY to the CLIENT shall not exceed \$100,000, or the LABORATORY'S total fee for services rendered on this project, whichever is greater. It is intended that this limitation apply to any and all liability or cause of action however alleged or arising, unless otherwise prohibited by law.

### Paragraph 4. INSURANCE:

- 4.1 LABORATORY shall secure and maintain throughout the full period of the services provided to the CLIENT adequate insurance to protect it from claims under applicable Workmen's Compensation Acts and also shall maintain one million dollars of general liability coverage to cover claims for bodily injury, death or property damage as may arise from the performance of its services.
- 4.2 The CLIENT hereby warrants that it has sufficient insurance to protect its employees adequately under applicable Workmen's Compensation Acts and for bodily injury, death, or property damage.
- 4.3 No insurance of whatever kind or type, which may be carried by either party is to be considered as in any way limiting any other party's responsibility for damages resulting from their operations or for furnishing work and materials.

**Paragraph 5. PAYMENT:**

- 5.1 CLIENT shall pay to LABORATORY such fees for services as previously agreed, orally or in writing, within 30 days of presentment of a bill for such services performed. In the event CLIENT ordered, orally or in writing, services but such services were not assigned a rate for billing, such services shall be billed at the LABORATORY's reasonable and customary rate.
- 5.2 CLIENT shall be responsible for all shipping, customs and other expenses related to services provided by LABORATORY to the CLIENT, and shall fully insure any test sample or other equipment provided to LABORATORY by the CLIENT.
- 5.3 Amounts overdue from CLIENT to LABORATORY shall be charged interest at a rate of 1½% per month.

**Paragraph 6. ISO/IEC GUIDE 17025 ADDITIONS:**

- 6.1 CLIENT agrees that this test report will not be reproduced except in full, without written approval from the LABORATORY.
- 6.2 CLIENT agrees that this test report shall not be used to claim product endorsement by A2LA or ANSI or any agency of the U.S. Government.
- 6.3 CLIENT agrees that test results presented herein relate only to the sample tested by the LABORATORY.

**A2LA Accreditation**

**SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999**

CURTIS-STRAUS  
 527 Great Road  
 Littleton, MA 01460  
 Jon Curtis Phone: 978-486-8880

**ELECTRICAL**

Valid until: October 31, 2003

Certificate Number: 1627-01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following Electromagnetic Compatibility (EMC), Telecommunications, and Product Safety tests:

**Electromagnetic Compatibility (EMC)**

Radiated emissions testing (electric and magnetic fields); Conducted emissions testing (voltage and current); Electrostatic Discharge testing; Electrical Fast Transient testing; Radiated Immunity testing; Conducted Immunity testing; Lightning Immunity testing; Voltage Dips, Interrupts and Voltage Variations testing; Magnetic Immunity testing; RF Power measurements; Frequency Stability measurements; Longitudinal Induction measurements; Harmonic emissions testing; Light flicker testing; Low frequency disturbance voltage testing; Disturbance Power measurements

EMC Standards Emissions	Title		
CISPR 22 1997 with amendments 1 and 2	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.	CNS 13439 AS/NZS 1053: 1999	Broadcast receiver and associated equipment Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment.
CNS13438 1994	Limits and methods of measurement of radio interference characteristics of information technology equipment.	CISPR 14 1993	Limits and methods of measurement of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and electric apparatus.
EN55022:1994 and 1998	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.	EN 55014 1993, 1997	Limits and methods of measurement of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus.
SABS CISPR 22:1997	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement	AS/NZS 1044: 1995	Limits and methods of measurement of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus.
Canada ICES-003 1997 AS/NZS 3548 1995	Digital apparatus Australian/New Zealand Standard Limits and methods of measurement of radio disturbance characteristics of information technology equipment		Limits and methods of measurement of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus.
CISPR 11 1990, 1997	Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.	<i>Immunity</i> CNS13783-1 SABS CISPR 14-1 1993	Household Electrical Appliances Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus Part 1: Emission – Product family standard
EN 55011 1991, 1998	Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.	SABS CISPR 14-2 1997	Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus Part 2: Immunity - Product family standard
SABS CISPR 11:1997	Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics Limits and methods of measurement	CISPR 14-2 1996	Immunity requirements for household appliances, tools and similar apparatus.
Canada ICES-001 1998	Industrial, scientific and medical radio frequency generators	CISPR 20 with amendment 3	Limits and methods of measurement of immunity characteristics of sound and television broadcast receivers and associated equipment.
CNS13803 AS/NZS 2064: 1997	Industrial, Scientific and Medical Instrument Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.	EN 55020 1995	Electromagnetic immunity of broadcast receivers and associated equipment.
CSA C108.8 – M1983	Electromagnetic Emission from Data Processing Equipment and Electronic Office Machines	CISPR 24	Information technology equipment – Immunity characteristics – Limits and methods of measurement
CISPR 13 1996, 1998	Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment.	SABS CISPR 24 1997	Information technology equipment – Immunity characteristics – Limits and methods of measurement
EN 55013 1990	Sound and television broadcast receivers and associated equipment: Electromagnetic compatibility. Part 1: Specification for limits and methods of measurement of radio disturbance characteristics of broadcast receivers and associated equipment.	AS/NZS 3200.1.2: 1995	Approval and test specification – Medical electrical Equipment – General requirements for safety – Collateral Standard: Electromagnetic compatibility – Requirements and tests.
EN 55013 Amend 12 1994	Limits and methods of measurement of radio disturbance characteristics of broadcast receivers and associated equipment. Amendment 12	<i>European Union Basic EMC Standards</i> EN 61000-4-2 1995, 1999	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 2: Electrostatic discharge immunity test – Basic EMC Publication
SABS CISPR 13: 1996	Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment.	EN 61000-4-3 1997, 1998 AS/NZS 61000.4.3 1999	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 3: Radiated, radio-frequency, electromagnetic field immunity test



<p>EN 61000-4-4 1995 EN 61000-4-5 1995 AS/NZS 61000.4.5 1999 EN 61000-4-6 1996 AS/NZS 61000.4.6 1999 EN 61000-4-8 1994 EN 61000-4-11 1994 EN 61000-2-2 1993</p>	<p>Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 4: Electrical fast transient/burst immunity test – Basic EMC publication (EMC) Part 4: Testing and measurement techniques. Section 5: Surge immunity test. Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 6: Immunity to conducted disturbances, induce by radio-frequency fields Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 8: Power frequency magnetic field immunity test. (EMC) Part 4: Testing and measurement techniques. Section 11: Voltage dips, short interruptions and voltage variations immunity tests. Electromagnetic compatibility (EMC). Part 2: Environment, Section 2: Compatibility levels for low-frequency conducted disturbances and signaling in public low-voltage power supply systems (IEC 1000-2-2:1990)</p>	<p>EN 61326 1998 EN 61547 1996 EN 50130-4 1996 EN 55104 1995 EN 50083-2 1995 EN 60601-1-2 1993 IEC 1800-3 1995 EN 60555 Part 2 1987 EN 60555 Part 3 1987 EN 61000-3-2 1995 AS/NZS 61000.3.2 1998 EN 61000-3-3 1995 AS/NZS 61000.3.3 1999 ETS 300 386-1 1994 ETS EN 300 386-2 1997, 1998 ETS 300 132-1 1996 ETS 300 132-2 1996 ETR 283 1997</p>	<p>Electrical equipment for measurement, control and laboratory use – EMC requirements Equipment for general lightning purposes – EMC immunity requirements Alarm Systems. Part 4: Electromagnetic compatibility. Product family standard: Immunity requirements for components of fire, intruder and social alarm systems. Electromagnetic compatibility immunity – requirements for household appliances, tools and similar apparatus. Product family standard. Cabled distribution systems for television and sound signals. Part 2: Electromagnetic compatibility for equipment. Medical electrical equipment Part 1: general requirements for safety Section 2: Collateral standard: Electromagnetic compatibility – requirements and tests Adjustable speed electrical power drive systems. Part 3: EMC product standard including specific test methods. Disturbances in supply systems caused by household appliances and similar electrical equipment. Part 2: Harmonics Disturbances in supply systems caused by household appliances and similar electrical equipment. Part 3: Voltage fluctuations. Electromagnetic compatibility (EMC). Part 3: Limits Section 2: Limits for harmonic current emissions Electromagnetic compatibility (EMC). Part 3: Limits Section 2: Limitation of voltage fluctuations and flicker in low-voltage supply systems. Equipment Engineering (EE); Public telecommunication network equipment electromagnetic compatibility (EMC) requirements Part 1: Product family overview, compliance criteria and test levels Electromagnetic compatibility and radio spectrum matters (ERM); Telecommunication network equipment; Electromagnetic compatibility (EMC) requirements; Part 2: Product family standard. Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 1: Operated by alternating current (ac) derived from direct current (dc) sources Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc) Equipment Engineering (EE); Transient voltages at Interface A on telecommunications direct current (DC) power distributions.</p>
<p><i>EU Product Family Standards</i> EN 50081-1 1992 EN 50081-2 1993 EN 50082-1 1992, 1998 EN 50082-2 1995 EN 61000-6-1 1997 EN 61000-6-2 1998 EN 50091-2 1996 EN 55024 1998 EN 55103-1 1997 EN 55103-2 1997</p>	<p>Electromagnetic capability – Generic emission standard. Part 1: Residential, commercial and light industry. (I.S.) Electromagnetic compatibility – Generic emission standard. Part 2: Industrial environment Electromagnetic compatibility – Generic emission standard. Part 1: Residential, commercial and light industry Electromagnetic compatibility – Generic immunity Standard. Part 2: Industrial environment Electromagnetic Compatibility (EMC)- Part 6: Generic standards- Section 1: Immunity for residential, commercial and light-industrial environments Electromagnetic Compatibility (EMC)- Part 6: Generic standards- Section 2: Immunity for industrial environments Specification for Uninterruptible Power Systems (UPS). Part 2: EMC requirements Information technology equipment – Immunity Characteristics – Limits and methods of measurement. Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Part 1: Emission Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control professional use. Part 2: Immunity</p>	<p>(A2LA Cert. No. 1627-01) Revised 02/21/02 <i>Pete Klapp</i> Page 4 of 9</p>	<p>(A2LA Cert. No. 1627-01) Revised 02/21/02 <i>Pete Klapp</i> Page 5 of 9</p>

<p><i>EU radio standards</i> (ETS) EN 300 385 v1.2.1 1998 (ETS) EN 300 220-1 v1.2.1 1997 (ETS) EN 300 220-2 v1.2.1 1997 (ETS) EN 300 330 v1.2.1 1998 ETS 300 328 1996 ETS EN 300 440 v1.2.1 1999  <i>Canada Radio Standards</i> Canadian GL-36 1995 Canadian RSS-119 1996 Canadian RSS-134 1996 Canadian RSS-210 Issue 3, Feb 5, 2000 RFS29 1998  <i>FCC Standards</i> 47 CFR FCC low power transmitters operating on frequencies below 1 GHz, emergency alert systems, unintentional radiators and ISM devices. 47 CFR FCC low power transmitters operating on frequencies above 1 GHz, with the exception of spread spectrum devices.</p>	<p>Electromagnetic compatibility and Radio spectrum matters (ERM); ElectroMagnetic Compatibility (EMC) standard for fixed radio links and ancillary equipment Electromagnetic compatibility and Radio spectrum matters (ERM); Short range devices; Technical characteristics and test methods for radio equipment to be used in the 25 MHz to 1000 MHz frequency range with power levels ranging up to 500 mW; Part 1: Parameters intended for regulatory purposes Electromagnetic compatibility and Radio spectrum matters (ERM); Short range devices; Technical characteristics and test methods for radio equipment to be used in the 25 MHz to 1000 MHz frequency range with power levels ranging up to 500 mW; Part 2: Supplementary parameters not intended for regulatory purposes Electromagnetic compatibility and Radio spectrum matters (ERM); Short range devices (SRD); Technical characteristics and test methods for radio equipment in the range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz Radio Equipment and Systems (RES); Wideband transmission systems; Technical characteristics and test conditions for data transmission equipment operating in the 2.4 GHz ISM band and using spread spectrum modulation techniques Electromagnetic compatibility and Radio spectrum matters (ERM); Short range devices; Technical characteristics and test methods for radio equipment to be used in the 1 Ghz to 40 Ghz frequency range  Industry Canada – technical requirements for low power Devices in the 2400 – 2483.5 MHz band. Industry Canada – Land mobile and fixed radio transmitters and receivers, 27.41 to 960.0 MHz Industry Canada – 900 MHz narrowband personal communications services Industry Canada – Low power license-exempt radio communication devices Specification for Restricted Radiation Radio Apparatus (New Zealand)</p>	<p>47 CFR FCC Unlicensed Personal Communications System (PCS) devices 47 CFR FCC Unlicensed National Information Infrastructure devices and low power transmitters using spread spectrum techniques. 47 CFR FCC Personal mobile Radio Services in the following FCC Rule Parts 22, 24, 25, 27. 47 CFR FCC General Mobile Radio Services in the following FCC Rule Parts 22, 74, 90, 95, 97. 47 CFR FCC Maritime and Aviation RadioServices in 47 CFR Parts 80 and 87 47 CFR FCC Microwave Radio Services in 47 CFR Parts 21, 74 and 101. FCC/OST MP-5 1986  GR-1089-CORE 1997, 1999  <i>ANSI EMC Standards</i> ANSI C63.4 1992, 1999  ANSI C63.5 1988  <i>IEEE EMC Standards</i> IEEE C62.41 1980  <i>Swedish EMC Standards</i> BAKOM 3336.3 1995  <i>South African EMC standards other than CISPR equivalents</i> SABS 1718-1: 1996  <i>Japanese VCCI Standards</i> VCCI V-3/99.05 1999 VCCI V-4/99.05 1999</p>	<p>Scope A3 Scope A4 Scope B1 Scope B2 Scope B3 Scope B4 FCC (Federal Communications Commission) methods of measurement of radio noise emissions from industrial, scientific and medical equipment. Bellcore electromagnetic compatibility and electrical safety – Generic criteria for network telecommunications equipment. American National Standard of methods of measurement of radio-noise emissions for low-voltage electrical and electronic equipment in the range of 9 kHz to 40GHz. American National Standard for electromagnetic compatibility – radiated emissions measurements in electromagnetic interference (EMI) control – calibration of antennas. IEEE recommended practice on surge voltages in low-voltage AC power circuits Electromagnetic compatibility and electrical safety (EMC &amp; S) for wired terminal equipment. Harmonization documentation information over the OFCOM requirements. South African Bureau of Standards: Specification for Gaming equipment. Part 1: Casino equipment. Technical Requirements Instruction for Test Conditions for Requirement under test</p>
<p>(A2LA Cert. No. 1627-01) Revised 02/21/02 <i>Pete Klapp</i> Page 6 of 9</p>	<p>(A2LA Cert. No. 1627-01) Revised 02/21/02 <i>Pete Klapp</i> Page 7 of 9</p>		



**Telecommunications**

Telecommunications Registration; General test methods; Lightning surge; Drop testing; Balance testing; Signal power (metallic and longitudinal); Frequency measurements; Pulse templates; Leakage testing; Impedance testing; Hearing Aid Compatibility testing; Protocol analysis and Jitter testing.

Telecom Standards	Title		
FCC 47 CFR Part 68 Telephone Terminal Equipment	Connection of terminal equipment to the telephone network. Analog and Digital Equipment. TCB Scope C1.	TBR 013 : 1996	Business TeleCommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Attachment requirements for terminal equipment interface
CS-03 Issue 8 1996 through amendment 3	Specification for terminal equipment, terminal systems, Network protection devices, connection arrangements and hearing aids compatibility. Bulletin Part 68 Rationale and Measurement Guidelines (Feb 1998)	TBR 21 : 1998	Terminal Equipment (TE); Attachment requirements for pan-European approval for connection to the analogue Public Switched Telephone Networks (PSTNs) of TE (excluding TE supporting the voice telephony service) in which network addressing, if provided, is by means of Dual Tone Multi Frequency (DTMF) signaling
TIA/EIA TSB31-B 1998	Attachment requirements for terminal equipment to be connected to circuit switched data networks and leased circuits using a CCITT Recommendation X.21 interface, or at an interface physically, functionally and electrically compatible with CCITT Recommendation X.21 but operating at any data signalling rate up to, and including, 1 984 kbit/s	TBR 24 : 1997	Business TeleCommunications (BTC); 34 Mbit/s digital unstructured and structured leased lines (D34U and D34S); Attachment requirements for terminal equipment interface
TBR 1 : 1995	Attachment requirements for Data Terminal Equipment (DTE) to connect to Packet Switched Public Data Networks (PSPDNs) for CCITT Recommendation X.25 interfaces at data signalling rates up to 1 920 kbit/s utilizing interfaces derived from CCITT Recommendations X.21 and X.21 bis	Australia TS 002 : 1997	Analogue Interworking and Non interference Requirements for Customer Equipment Connected to the Public Switched Telephone Network
TBR 2 : 1997	Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access Integrated Services Digital Network (ISDN);	TS 016 : 1997	General Requirements for Customer Equipment Connected to Hierarchical Digital Interfaces
TBR 3 : 1995 + Amdt : 1997	Attachment requirements for terminal equipment to connect to an ISDN using ISDN primary rate access Integrated Services Digital Network (ISDN);	TS 031 : 1997 TS 038 : 1997	Requirements for ISDN Basic Access Interface Requirements for ISDN Primary Rate Access Interface
TBR 4 : 1995 + Amdt : 1997	Attachment requirements for terminal equipment to connect to an ISDN using ISDN primary rate access Business TeleCommunications (BT); Open Network Provision (ONP) technical requirements: 2 048 kbit/s digital unstructured leased line (D2048U) Attachment requirements for terminal equipment	ASI/ACIF S043.2:2001	Requirements for Customer Equipment for connection to a metallic loop interface of a Telecommunications Network – Part 2 Broadband
TBR 012 : 1993 + Amdt : 1996			

(A2LA Cert. No. 1627-01) Revised 02/21/02 Page 8 of 9

**Product Safety**

General test methods; Input tests; Electric strength tests; Impulse tests; Permanency of marking tests; Accessibility tests; Energy Hazard measurements; Capacitor discharge tests; Humidity conditioning; Earthing tests; Limited power source measurements; Stability tests; Steel ball tests; Lithium Battery Reverse Current measurements; Leakage current tests; Transformer abnormal tests; Telecom leakage tests; Overvoltage/power cross tests.

Product Safety Standards	Title		
<b>Specific Product Safety Standards</b> IEC 950 1991 Includes Amendments 1, 2, 3 and 4 UL 1950 1998	Safety of information technology equipment including electrical business equipment. Safety of information technology equipment, including electrical business equipment.	UL 3111-1 1996 UL 3121-1 1995 IEC 60601-1 1995	Electrical measuring and test equipment. Part 1: General requirements. Medical electrical equipment. Part 1: General requirements for safety.
CSA C22.2 No.950-95	Safety of Information Technology Equipment (UL 1950)	EN 60601-1 UL 2601-1 1997	Medical electrical equipment. Part 1: General Requirements for safety.
UL 60950 2000 IEC 60950 2000 EN 60950 1997, 1998 IEC 60950-1 2001 AS/NZS 3260 1993	Safety of information technology equipment Safety of information technology equipment Safety of information technology equipment, including Electrical business equipment.	IEC 60065 1998, 2000 ANSI/UL 6500: 1998 CAN/CSA 60065-00	Audio, video and similar electronic apparatus – Safety requirements Audio/video and musical instrument apparatus for Household, commercial and similar general use
AS/NZS 3260 Supp 1 1996	Approval and test specification – Safety of information technology equipment including electrical business Equipment.	AS/NZS 3250 1995 AS/NZS 60065 2000	Australian/New Zealand Standard – Approval and test Specification – Mains operated electronic and related Equipment for household and similar general use
ACA TS 001 1997	Approval and test specification – Safety of information technology equipment including electrical business equipment – Alphabetical reference index to IEC 950 (Supplement to AS/NZS 3260:1993)	Canadian C22.2 No. 1-94 (1-98) 1994, 1998 EN 60065 1994	Audio, video and similar electronic equipment. Consumer and commercial products Safety requirements for main operated electronic and related apparatus for household and similar general use.
UL 1459 1995 IEC 1010-1 1990 IEC 61010-1 1993	Australian Communications Authority – Safety requirements for customer equipment. Telephone Equipment Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements.	IEC 60825 1990	Radiation safety of laser products, equipment Classification, requirements and user's guide Safety of laser products Part 1: equipment Classification, requirements and user's guide.
EN 61010-1 1993 IEC 61010-1 2000	Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements.	EN 60825-1 1994 IEC 60825-1 2001 IEC 60825-2 2000-5	Safety of laser products – Part 2: Safety of optical communication systems Safety of laser products – Part 4: Laser guards
UL 3101-1 1993 CAN/CSA 1010-1 1999 (Including AM 2)	Electrical equipment for laboratory use Part 1: General requirements.	IEC 60825-4 1997-11 IEC 60335-1 1995 (Including AM2 – 1997 & AM 12 – 1997) EN 60335-1 2001 UL 60335-1 1998 CAN/CSA E335-1 1994	Safety of household and similar electrical appliances Part 1: General requirements

(A2LA Cert. No. 1627-01) Revised 02/21/02 Page 9 of 9

