



Report No	EE0563-3
Client	AES Corporation 285 Newbury Street Peabody, MA 01960
Phone	978-535-7310
Fax	508-535-7313
FRN	0003-6214-63
<hr/>	
Model	52-7880-A
FCC ID	L9N-7880-A
Equipment Type Equipment Code	Licensed Non-Broadcast Station Transmitter TNB
Results	As detailed within this report
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Prepared by	 Evan Gould – Test Engineer
Authorized by	 Michael Buchholz – EMC Manager
Issue Date	11/17/04
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.

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## ***Summary***

This report shows the results of testing the AES Model 7880-A UHF transceiver module to 47 CFR 90.201. The transmitter is able to operate at frequencies in the range 402-470MHz, and supports data rates up to 9600baud. The modulation employed is FSK.

## ***Test Methodology***

Radiated spurious emissions testing was performed according to the procedures specified in ANSI/TIA-603-B-2002.

Frequency range investigated: 30MHz – 5GHz

Measurement distance: 3m

**EUT Configuration**

<b>EUT Configuration</b>					
<b>Work Order:</b> E0563					
<b>Company:</b> AES Corporation					
<b>Company Address:</b> 285 Newbury Street Peabody, MA 01960					
<b>Contact:</b> Dave Townzen					
<b>Person Present:</b> Dave Townzen					
<b>MN</b>		<b>SN</b>			
EUT: 52-7880-A		1			
EUT Description: UHF Transceiver					
EUT Max Frequency: 470MHz					
<b>Support Equipment:</b>		<b>MN</b>		<b>SN</b>	
BK Precision DC p/s	1730			-	
Laptop	WinBookXL			10807795	
demo board (supplies power and control interface)	CC1020			Rev 2.2	
Microchip TQFP Demo Board	PIC18FXS2064/80L			WEL032811145	
<b>EUT Cables:</b>		<b>Qty</b>	<b>Shielded?</b>	<b>Length</b>	<b>Ferrites</b>
<u>Demo Board Cables</u>					
DB25 parallel	1	Yes	2m	No	
DC wires	1 pair	No	0.5m	No	
SMA	1	Yes	6"	No	
<b>Unpopulated EUT Ports:</b>		<b>Qty</b>	<b>Reason</b>		
none					
<b>Software / Operating Mode Description:</b>					
Operating transmitter with SmartRF Studio to set center frequency, baud rate, frequency separation, etc.					



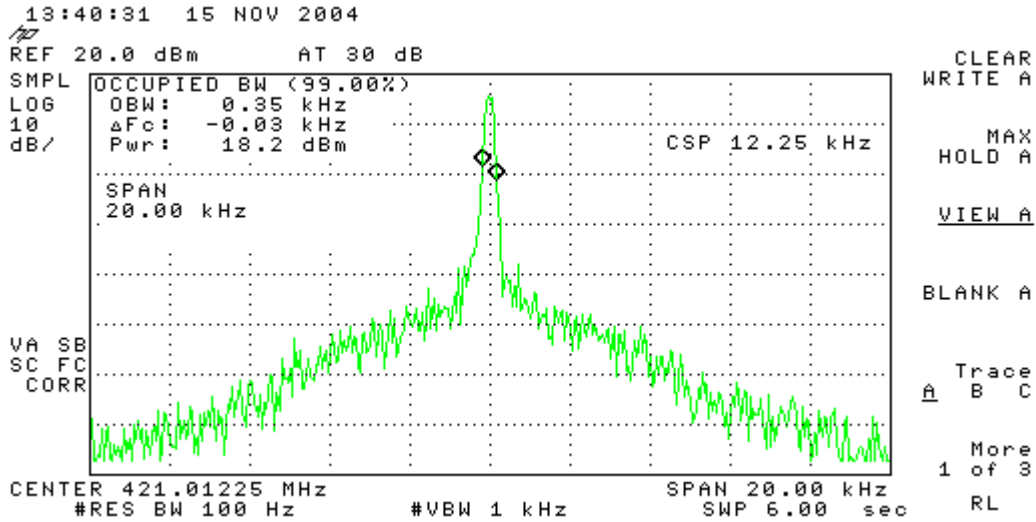
### Occupied Bandwidth

#### REQUIREMENT

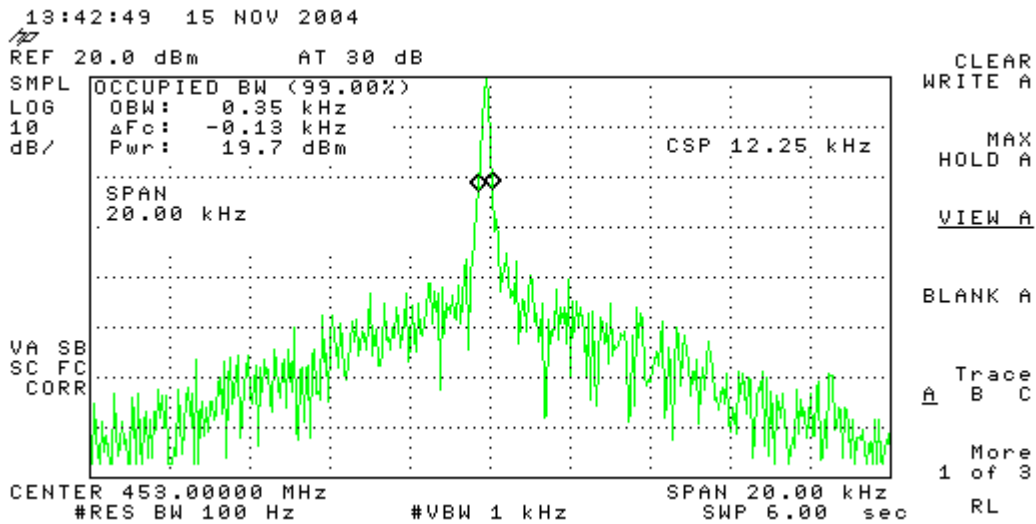
The bandwidth limit for this device is 11.25kHz. [90.209(b)(5)]

#### ANALYZER PLOTS

##### Low – 9600baud UART (225Hz freq sep)



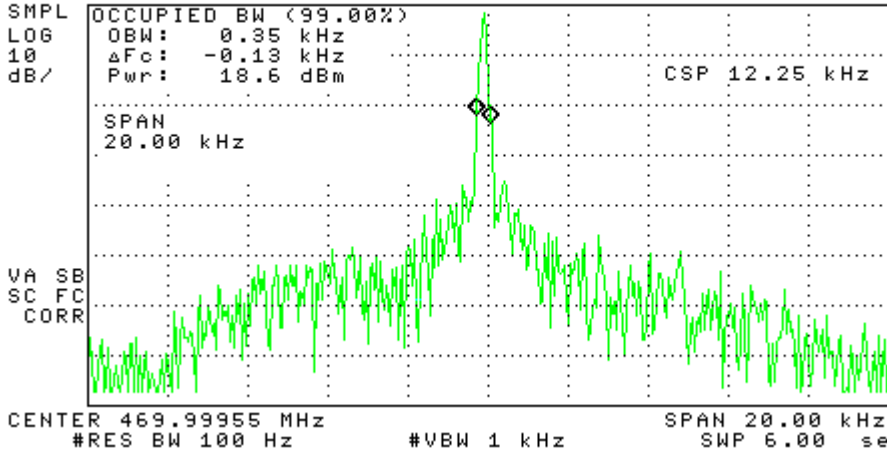
##### Mid – 9600baud UART (225Hz freq sep)



### High - 9600baud UART (225Hz freq sep)

13:51:00 15 NOV 2004

REF 20.0 dBm AT 30 dB



CLEAR  
WRITE A

MAX  
HOLD A

VIEW A

BLANK A

Trace  
A B C

More  
1 of 3  
RL



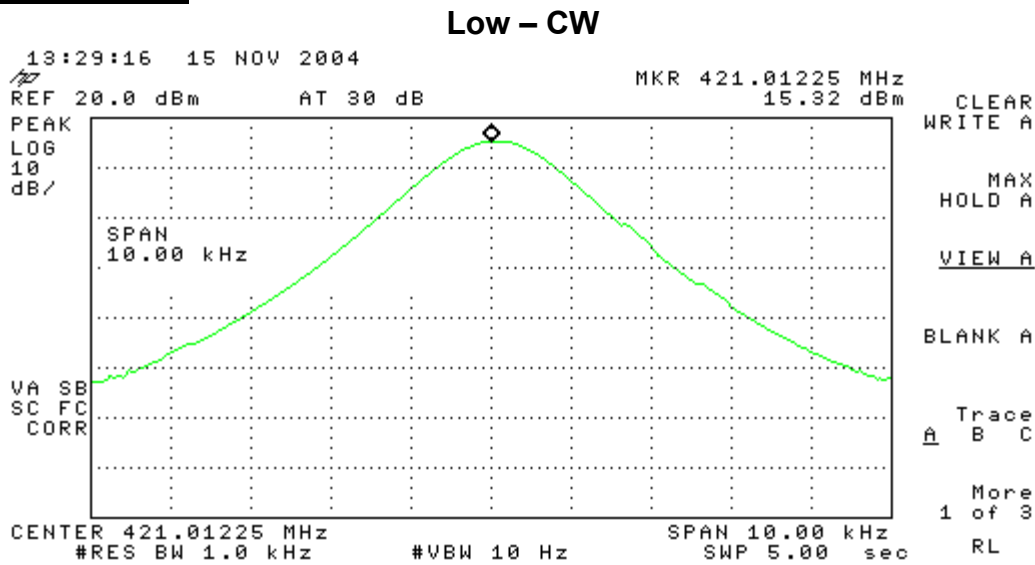
### Average Unmodulated Transmitter Carrier Power

The 6dB bandwidth of the CW signals measured is less than 1kHz, so a RBW of 1kHz was used to capture the average power.

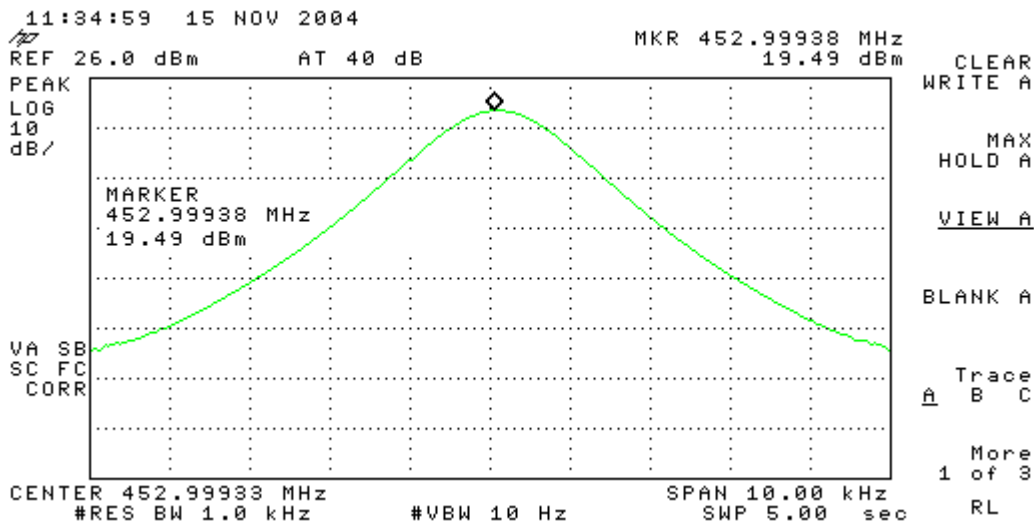
### MEASUREMENTS

Average Unmodulated Output Power				Curtis-Straus LLC	
Engineer: Evan Gould		Company: AES		Work Order: E0563	
Date: 11/15/2004		EUT: UHF Transceiver		Test Site: EMC 3	
Analyzer: Yellow			Cable: Microflex #7		
Notes: EUT settings: power = "+2"; unmodulated			Attenuator: 10dB		
Frequency (MHz)	Reading (dBm)	Attenuation Factor (dB)	Adjusted Reading (dBm)		
421.0125	15.30	10	25.30		
445.5	19.20	10	29.50		
470	17.70	10	27.70		

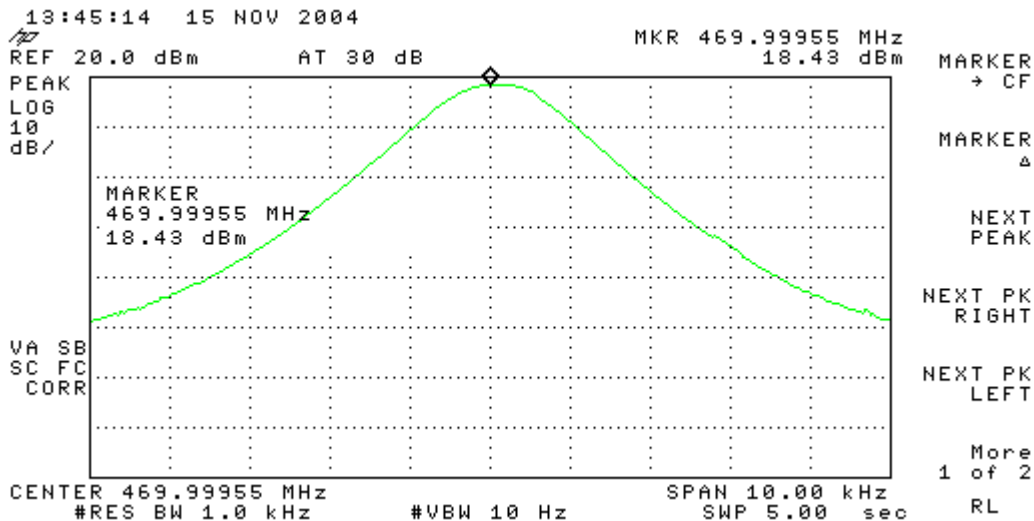
### ANALYZER PLOTS



### Mid - CW



### High - CW



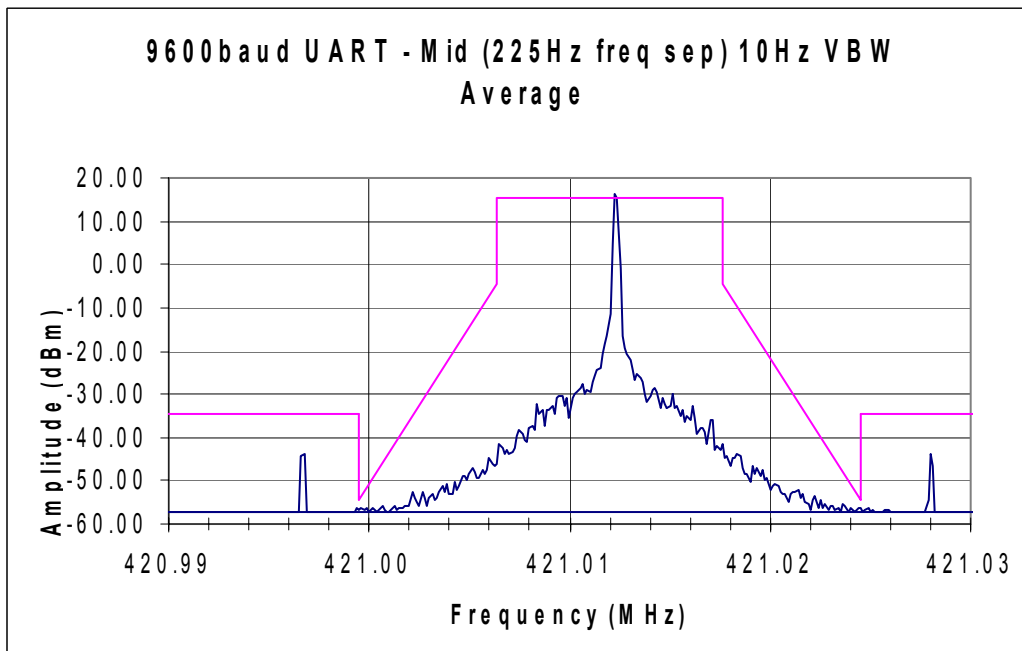
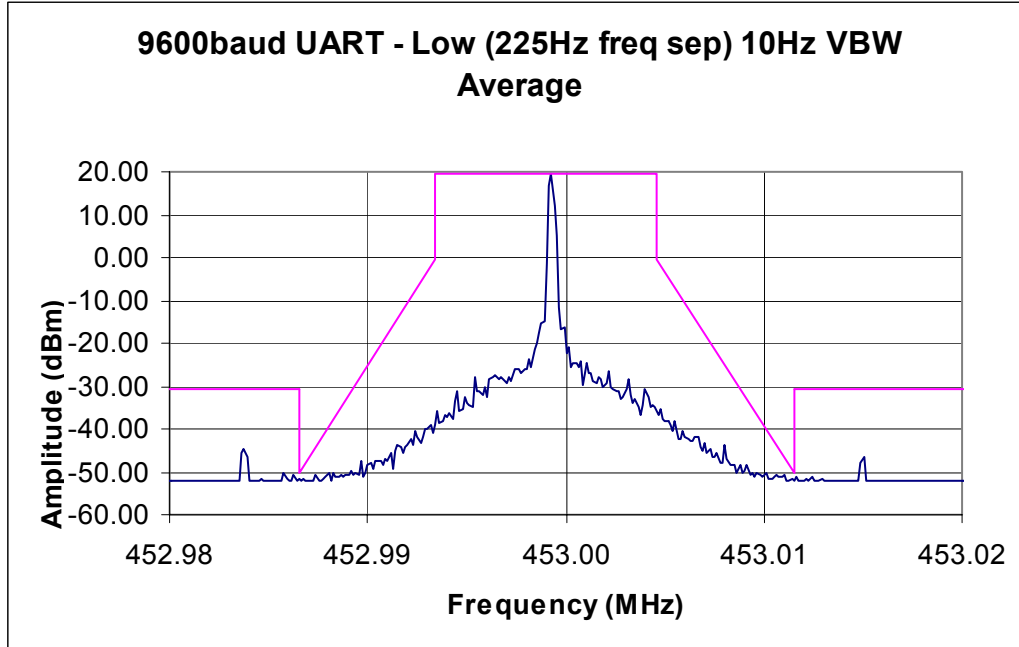


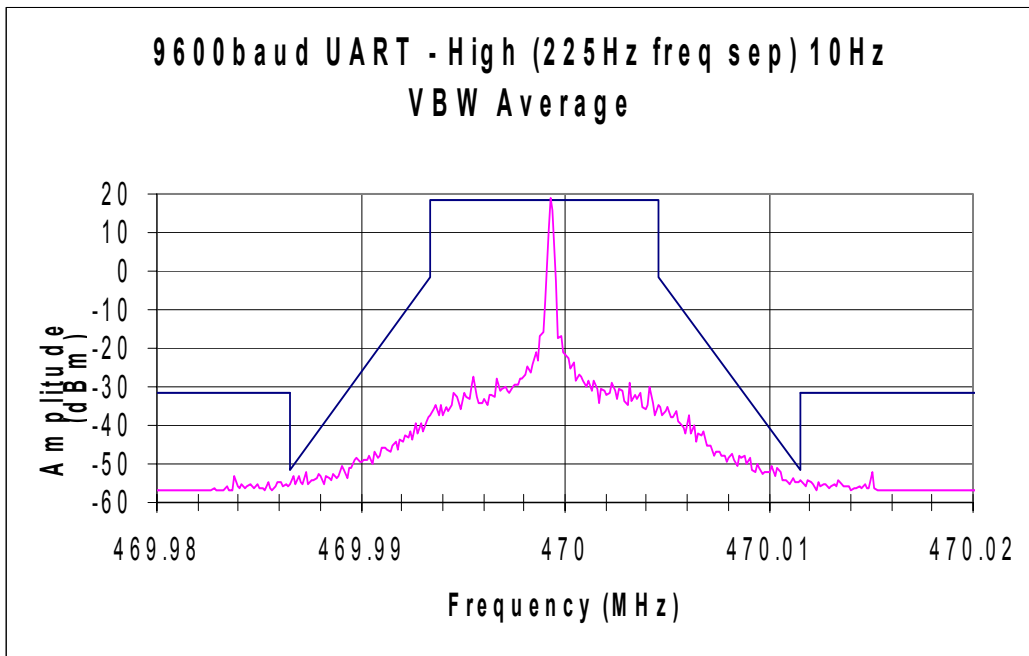
### Emission Masks

#### REQUIREMENT

The masks shown below are specified in 47 CFR 90.210(d)

#### PLOTS





## Frequency Stability

### REQUIREMENT

"...transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table (1.5ppm)." [90.213(a)]

### MEASUREMENTS

Frequency Stability 47 CFR 90.213(a)				Curtis-Straus LLC		
Engineer: Evan Gould		Company: AES		Work Order: E0563		
Date: 7/15/2004		EUT: UHF Transceiver		Test Site: ENV Chamber		
Notes: EUT settings: transmitting on 445.5MHz, NRZ format, unmodulated, 4.95kHz frequency separation						
Voltage (VDC)	Temperature (°C)	Frequency (MHz)	Delta (Hz)	Delta (ppm)	Limit (ppm)	Result (Pass/Fail)
5	20	445.503815	<b>NOMINAL VALUE</b>			
5.75	20	445.503760	-55	0.12346	1.5	Pass
4.25	20	445.503740	-75	0.16835	1.5	Pass
5	-30	445.504040	225	0.50505	1.5	Pass
5	50	445.503445	-370	0.83052	1.5	Pass

### Conducted Spurious Emissions

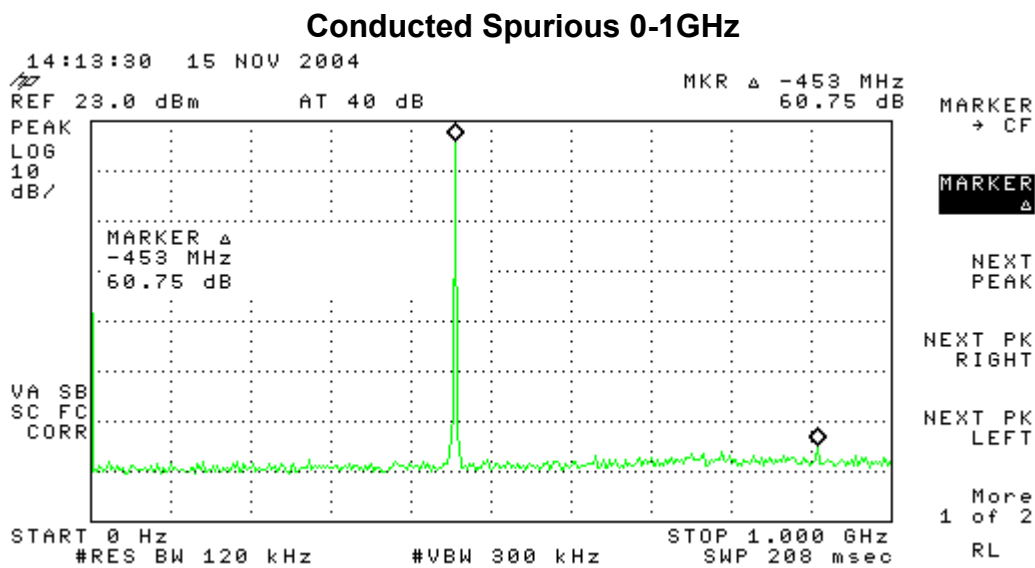
#### LIMIT

"For transmitters designed to operate with a 12.5kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:...On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5kHz: At least  $50 + 10 \log (P)$  or 70 dB, whichever is the lesser attenuation." [90.210(d)(3)]

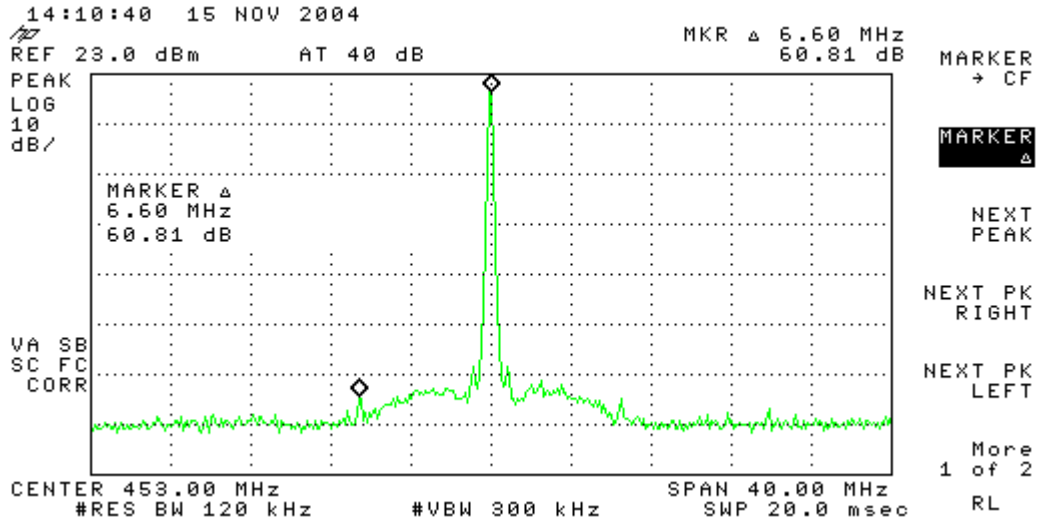
$29.5\text{dBm} = 0.89\text{W}$

$50 + 10 \log (0.89\text{W}) = 49.5\text{dB}$

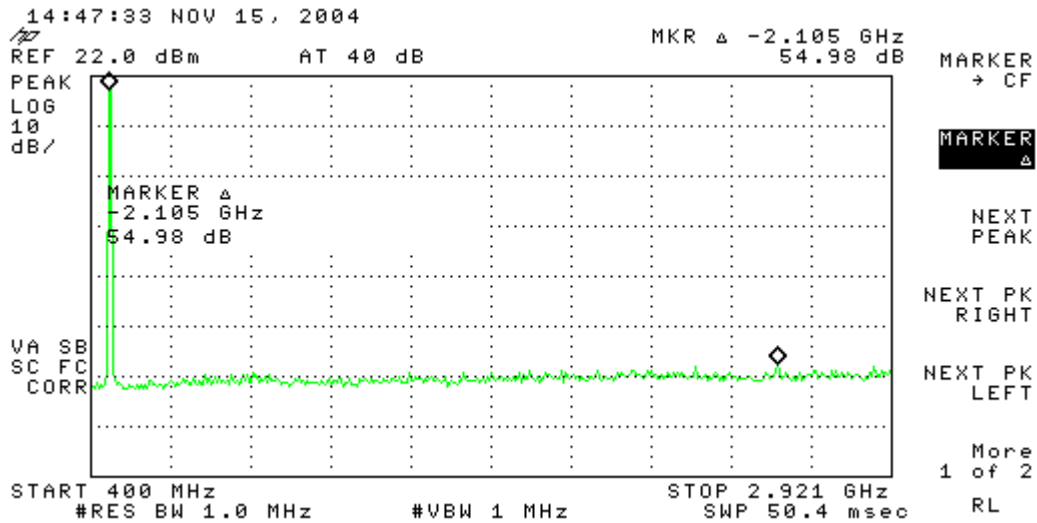
#### ANALYZER PLOTS



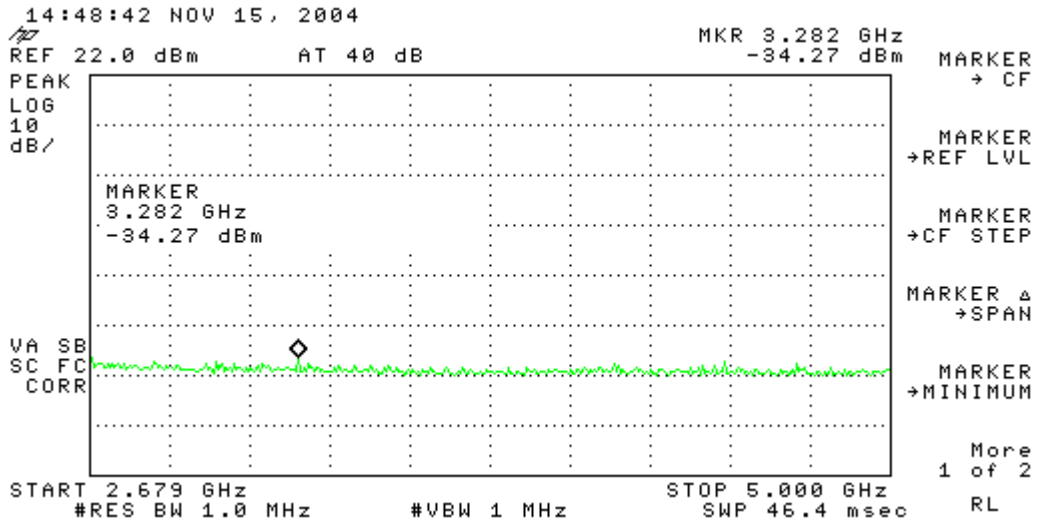
### Conducted Spurious 453MHz



### Conducted Spurious 0.4-2.921GHz



### Conducted Spurious 2.679-5GHz



## Radiated Spurious Emissions

### LIMIT

Same as the Conducted Spurious Emissions Limit above.

### MEASUREMENTS

Radiated Spurious Emissions								
Date: 16-Jul-04 Test Site: "T"			Company: AES EUT: UHF Transceiver			Engineer: Evan Gould		
Receiving Antenna Setup: Analyzer: Yellow Cable: 142LL#3 Antenna: Black Horn Distance: 3m			Substitution Setup: Signal Generator: HP 83752A Cable: 142LL#5 Antenna: Yellow Horn					
Antenna Polarity (V/H)	Frequency (MHz)	Analyzer Reading (dBµV/m)	Signal Generator Output Level (dBm)	Cable Attenuation Factor (dB)	Antenna Gain (dBi)	Adjusted Reading (dBm)	Limit (see Note) (dBm)	Result (Pass/Fail)
H	1336	42.1	-35.2	1.4	4.8	-31.8	-20	Pass
V			-34.5	1.4	4.8	-31.1	-20	Pass
V	1782	50.1	-24.4	1.6	5.3	-20.7	-20	Pass
H			-25.8	1.6	5.3	-22.1	-20	Pass
H	2227	40.7	-33.9	1.8	6.0	-29.7	-20	Pass
V			-32.9	1.8	6.0	-28.7	-20	Pass
H	2673	30.1	-42.9	2.0	6.2	-38.7	-20	Pass
V			-42.9	2.0	6.2	-38.7	-20	Pass

Note: Limit[dBm] = Peak Output Power - (50 + 10 log (P[W])) [47 CFR 90.210(d)(3)]

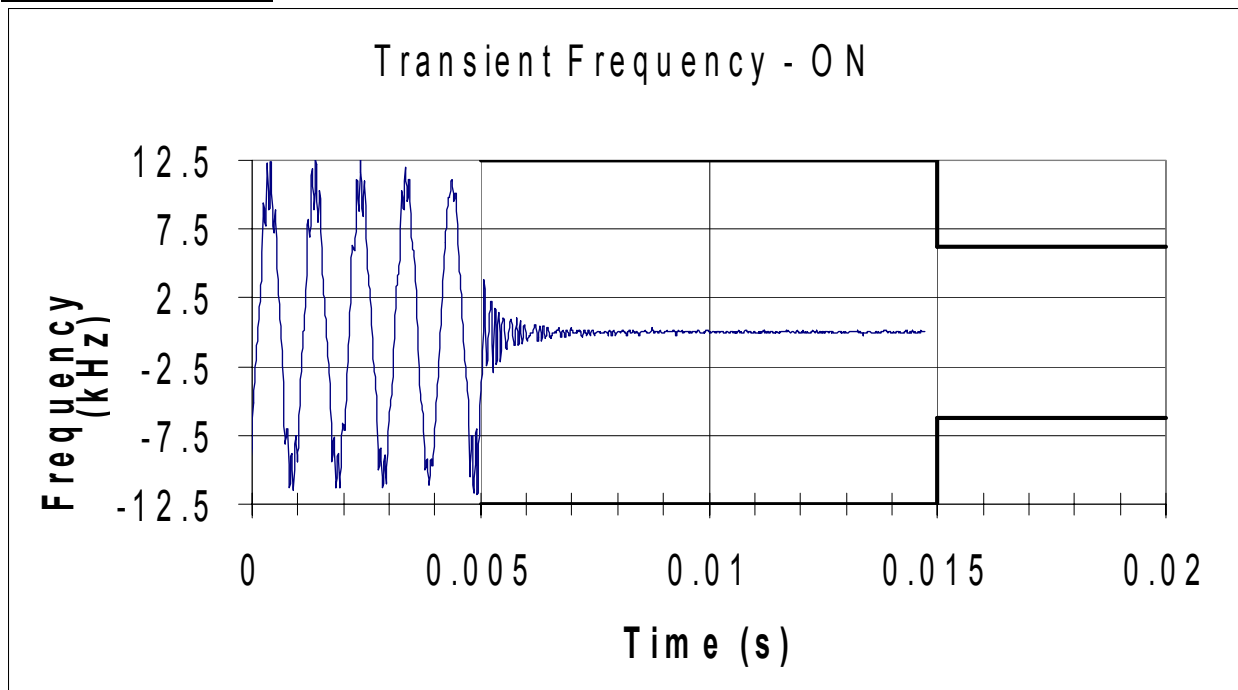
### Transient Frequency Behavior

#### REQUIREMENT

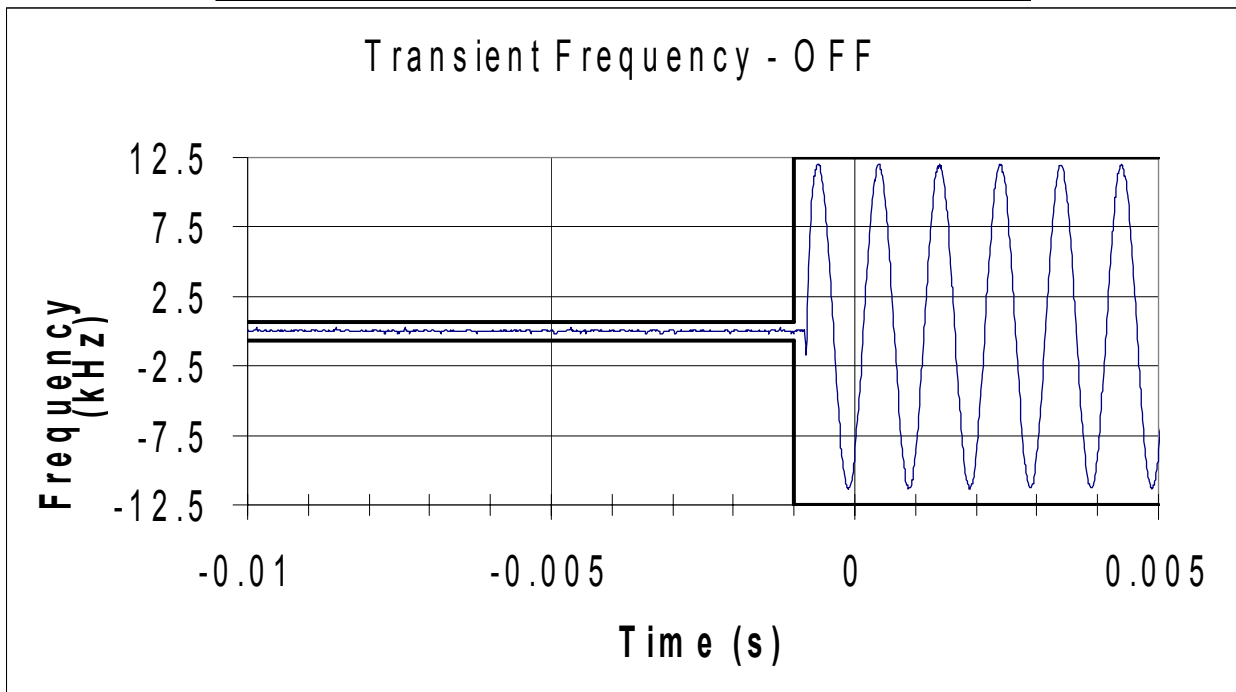
“Transmitters designed to operate in the...421-512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated.” [90.214]

Time Intervals	Maximum Frequency Difference	Time Limit
t1	±12.5 kHz	10.0 ms
t2	±6.25 kHz	25.0 ms
t3	±12.5 kHz	10.0 ms

#### MEASUREMENTS







**Test Equipment Used**

REV. 13-JUL-2004

<b>SPECTRUM ANALYZERS</b>						
	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
YELLOW	9kHz-2.9GHz	8594E	HP	3523A01958	00100	11-AUG-2005
ORANGE	9kHz-26.5GHz	E4407B	HP	US39440975	00394	05-NOV-2005
<b>OPEN AREA TEST SITE (OATS)</b>		FCC CODE	IC CODE	VCCI CODE	CALIBRATION DUE	
SITE T		93448	IC 2762-T	R-905	25-MAR-2005	
<b>PREAMPS / ATTENUATORS / FILTERS</b>						
	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
GREEN	0.01-2000MHz	ZFL-1000-LN	C-S	N/A	00802	27-FEB-2005
ORANGE-BLACK	1-20GHz	SMC-12A	C-S	637367	00761	29-JUL-2004
HF 20DB ATTENUATOR	0.03-20 GHz	PE 7019-20	PASTERNAK	01	00791	21-MAY-2005
<b>ANTENNAS</b>						
	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
GREEN-RED BILOG	30MHz-2GHz	CBL6112B	CHASE	2435	00990	06-APR-2006
GRAY BILOG	26MHz-2GHz	3141	EMCO	9703-1038	00066	19-MAY-2005(EMI) / 21-JUN-2005(RFI)
YELLOW HORN	1-18GHz	3115	EMCO	9608-4898	00037	22-MAY-2005
BLACK HORN	1-18GHz	3115	EMCO	9703-5148	00056	12-JUN-2005
ADJUSTABLE DIPOLE	30-1000MHz	3121C	EMCO	1371	00756	26-JUN-2005
<b>CHAMBERS AND STRIPLINE</b>						
	MN	MFR	SN	ASSET	CALIBRATION DUE	
ENVIRONMENTAL (SAFETY)	SGTH-31S	B-M-A INC.	2245	00321	31-DEC-2004	
<b>SIGNAL GENERATORS</b>						
	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
SWEEPER	0.01-20.0GHz	HP83752A	HP	3610A01133	00087	04-APR-2005
<b>OSCILLOSCOPES</b>						
	MN	MFR	SN	ASSET	CALIBRATION DUE	
OSCILLOSCOPE 100MHZ (TELECOM)	54645A	HP	US36320452	00103	30-JUN-2004	
<b>RMS VOLTMETERS/CURRENT CLAMP</b>						
	MN	MNFR	SN	ASSET	CALIBRATION DUE	
TRUE-RMS MULTIMETER	79III	FLUKE	71700298	00769	15-OCT-2004	

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			
<p>CURTIS-STRAUS<sup>1</sup> 527 Great Road Littleton, MA 01460 Barry Quinlan Phone: 978-486-8880</p> <p>ELECTRICAL</p>		<p>EN 55011 1991, 1998 characteristics of SABS CISPR 11: 1997</p> <p>Canada ICES-001 1998 CNS13803 AS/NZS 2064: 1997</p> <p>CSA C108.8 – M1983</p> <p>CISPR 13:1996, 1998, 2001</p> <p>EN 55013: 1990, 2001</p> <p>EN 55013 Amend 12 1994</p> <p>SABS CISPR 13: 1996</p> <p>CNS 13439 AS/NZS 1053: 1999</p> <p>CISPR 14 1993 (except discontinuous disturbances)</p> <p>EN 55014 1993, 1997 discontinuous disturbances)</p> <p>AS/NZS 1044: 1995 discontinuous disturbances)</p> <p>Immunity CNS13783-1 SABS CISPR 14-1 1993</p> <p>SABS CISPR 14-2 1997 + A1:2001</p>	<p>Limits and methods of measurement of radio disturbance industrial, scientific and medical (ISM) radio-frequency equipment – Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics Limits and methods of measurement</p> <p>Industrial, scientific and medical radio frequency generators</p> <p>Industrial, Scientific and Medical Instrument</p> <p>Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.</p> <p>Electromagnetic Emission from Data Processing Equipment and Electronic Office Machines</p> <p>Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment.</p> <p>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.</p> <p>Limits and methods of measurement of radio disturbance characteristics of broadcast receivers and associated equipment. Amendment 12</p> <p>Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment.</p> <p>Broadcast receiver and associated equipment Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment.</p> <p>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.</p> <p>Limits and methods of measurement of radio disturbance (except characteristics of electrical motor- operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus.</p> <p>Limits and methods of measurement of radio disturbance (except characteristics of electrical motor- operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus.</p> <p>Household Electrical Appliances</p> <p>Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus Part 1: Emission – Product family standard</p> <p>Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus Part 2: Immunity - Product family standard</p>
Valid until: July 31, 2005	Certificate Number: 1627-01		
<p>In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following <u>Electromagnetic Compatibility (EMC), Telecommunications, and Product Safety tests:</u></p> <p><b>Electromagnetic Compatibility (EMC)</b> 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</p>			
<b>EMC Standards</b>	<b>Title</b>		
<b>Emissions</b>			
CISPR 22 1997 with amendments 1 and 2	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.		
CNS13438 1994	Limits and methods of measurement of radio interference characteristics of information technology equipment.		
EN55022:1994 and 1998	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.		
SABS CISPR 22:1997	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement		
Canada ICES-003 1997	Digital apparatus		
AS/NZS 3548 1995	Australian/New Zealand Standard Limits and methods of measurement of radio disturbance characteristics of information technology equipment		
CISPR 11 1990, 1997, 1999	Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.		
<p><sup>1</sup> Note: This accreditation covers testing performed at the laboratory listed above and the satellite facility located at 168 Ayer Rd, Littleton, MA 01460</p>			
(A2LA Cert. No. 1627-01) 10/31/03	Page 1 of 11	(A2LA Cert. No. 1627-01) 10/31/03	Page 2 of 11
CISPR 14-2 1996, 1997 + A1:2001	Immunity requirements for household appliances, tools and similar apparatus.	EN 61000-6-1: 1997, 2001	Electromagnetic Compatibility (EMC)- Part 6: Generic standards- Section 1: Immunity for residential, commercial and light-industrial environments
CISPR 20: 1995, 2002 with amendment 3 (associated group only)	Limits and methods of measurement of immunity characteristics of sound and television broadcast receivers and associated equipment.	EN 61000-6-2: 1998, 2001	Electromagnetic Compatibility (EMC)- Part 6: Generic standards- Section 2: Immunity for industrial environments
EN 55020: 1995, 2002 (associated group only)	Electromagnetic immunity of broadcast receivers and Associated equipment.	EN 50091-2 1996	Specification for Uninterruptible Power Systems (UPS). Part 2: EMC requirements
CISPR 24	Information technology equipment – Immunity characteristics – Limits and methods of measurement	EN 55024 1998	Information technology equipment – Immunity Characteristics – Limits and methods of measurement.
SABS CISPR 24 1997	Information technology equipment – Immunity characteristics – Limits and methods of measurement	EN 55103-1 1997	Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Part 1: Emission
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 55103-2 1997 (excluding Annex A3)	Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control professional use. Part 2: Immunity
<b>European Union Basic EMC Standards</b>		EN 61326 1998	Electrical equipment for measurement, control and laboratory use – EMC requirements
EN 61000-4-2: 1995, 1999, 2001	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 2: Electrostatic discharge immunity test – Basic EMC Publication	EN 61547 1996	Equipment for general lighting purposes – EMC immunity requirements
EN 61000-4-3:1997, 1998, 2002 AS/NZS 61000.4.3 1999	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 3: Radiated, radio-frequency, electromagnetic field immunity test	EN 50130-4 1996	Alarm Systems. Part 4: Electromagnetic compatibility. Product family standard: Immunity requirements for components of fire, intruder and social alarm systems.
EN 61000-4-4 1995	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 4: Electrical fast transient/burst immunity test – Basic EMC publication	EN 55104 1995	Electromagnetic compatibility immunity – requirements for household appliances, tools and similar apparatus. Product family standard.
EN 61000-4-5 1995 AS/NZS 61000.4.5 1999 EN 61000-4-6 1996 AS/NZS 61000.4.6 1999	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 5: Surge immunity test.	EN 50083-2 1995	Cabled distribution systems for television and sound signals. Part 2: Electromagnetic compatibility for equipment.
EN 61000-4-8 1994	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 6: Immunity to conducted disturbances, induce by radio-frequency fields.	EN 60601-1-2: 1993, 2002	Medical electrical equipment Part 1: general requirements for safety Section 2: Collateral standard: Electromagnetic compatibility – requirements and tests
EN 61000-4-11 1994	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 8: Power frequency magnetic field immunity test.	IEC 1800-3 1995	Adjustable speed electrical power drive systems. Part 3: EMC product standard including specific test methods.
ENV 61000-2-2 1993	(EMC) Part 4: Testing and measurement techniques. Section 11: Voltage dips, short interruptions and voltage Variations immunity tests.	EN 60555 Part 2 1987	Disturbances in supply systems caused by household appliances and similar electrical equipment. Part 2: Harmonics
<b>EU Product Family Standards</b>		EN 60555 Part 3 1987	Disturbances in supply systems caused by household appliances and similar electrical equipment. Part 3: Voltage fluctuations.
EN 50081-1 1992	Electromagnetic capability – Generic emission standard. Part 1: Residential, commercial and light industry. (I.S.)	EN 61000-3-2: 1995, 2000 AS/NZS 61000.3.2 1998 EN 61000-3-3 1995 AS/NZS 61000.3.3 1999	Electromagnetic compatibility (EMC). Part 3: Limits Section 2: Limits for harmonic current emissions
EN 50081-2 1993	Electromagnetic compatibility – Generic emission standard. Part 2: Industrial environment	ETS 300 386-1 1994	Electromagnetic compatibility (EMC). Part 3: Limits Section 2: Limitation of voltage fluctuations and flicker in low-voltage supply systems.
EN 50082-1 1992, 1998	Electromagnetic compatibility – Generic emission standard. Part 1: Residential, commercial and light industry		Equipment Engineering (EE); Public telecommunication network equipment electro-magnetic compatibility (EMC) requirements Part 1: Product family overview, compliance criteria and test levels
EN 50082-2 1995	Electromagnetic compatibility – Generic immunity Standard. Part 2: Industrial environment		
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<p>ETS EN 300 386-2 1997, 1998, ETS EN 300 386 2000 v1.2.1, 2001 v1.3.1</p> <p>ETS 300 132-1 1996</p> <p>ETS 300 132-2 1996</p> <p>ETR 283 1997</p> <p><i>EU radio standards</i> (ETS) EN 300 385 v1.2.1: 1998, 1999</p> <p>EN 300 330 v1.2.1: 1998, 1999</p> <p>ETS 300 328 1996</p> <p>ETS EN 300 440 v1.2.1 1999</p> <p>EN 301 893:2002 v1.2.1</p> <p>ETS 300 836-1:1998</p> <p>EN301 489-17:2002 v1.2.1</p> <p>(A2LA Cert. No. 1627-01) 10/31/03</p> <p style="text-align: right;">Page 5 of 11</p>	<p>Electromagnetic compatibility and radio spectrum matters (ERM); Telecommunication network equipment; Electromagnetic compatibility (EMC) requirements; Part 2: Product family standard.</p> <p>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</p> <p>Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc)</p> <p>Equipment Engineering (EE): Transient voltages at Interface A on telecommunications direct current (DC) power distributions.</p> <p>Electromagnetic compatibility and Radio spectrum matters (ERM); Electromagnetic Compatibility (EMC) standard for fixed radio links and ancillary equipment (ETS)</p> <p>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</p> <p>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</p> <p>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</p> <p>Broadband Radio Access Networks (BRAN); 5 GHz (draft) high performance RLAN; Harmonized EN covering Essential requirements of article 3.2 of the R&amp;TTE Directive</p> <p>Broadband Radio Access Networks (BRAN); High Performance Radio Local Area Network (HIPERLAN) Type 1; Conformance testing specification; Part 1: Radio Type approval and Radio Frequency (RF) conformance test specification</p> <p>Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for 2.4 GHz wideband transmission systems and 5 GHz high performance RLAN equipment</p> <p>EN 300 328-2:2001 v1.2.1</p> <p>EN 301 489-1:2002</p> <p>EN 60669-2-1:2002</p> <p><i>Canada Radio Standards</i> Canadian GL-36 1995</p> <p>Canadian RSS-119 1999, 2000 Issue 6</p> <p>Canadian RSS-134 1996 &amp; 2000, Issue 1</p> <p>Canadian RSS-210 2000 Issue 3,</p> <p>RFS29 1998 Specification for Restricted Radiation Radio Apparatus (New Zealand)</p> <p><i>FCC Standards</i> 47 CFR FCC low power transmitters operating on frequencies below 1 GHz, emergency alert systems, unintentional radiators and ISM devices.</p> <p>47 CFR FCC low power transmitters operating on frequencies above 1 GHz, with the exception of spread spectrum devices.</p> <p>47 CFR FCC Unlicensed Personal Communications System (PCS) devices</p> <p>47 CFR FCC Unlicensed National Scope Information Infrastructure devices and low power transmitters using spread spectrum techniques.</p> <p>47 CFR FCC Personal mobile Radio Services in the following FCC Rule Parts 22, 24, 25, 27.</p> <p>47 CFR FCC General Mobile Radio Scope Services in the following FCC Rule Parts 22, 74, 90, 95, 97.</p> <p>47 CFR FCC Maritime and Aviation Scope RadioServices in 47 CFR Parts 80 and 87</p> <p>47 CFR FCC Microwave Radio Services Scope in 47 CFR Parts 21, 74 and 101.</p> <p>Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband Transmission systems; Data transmission equipment operating in the 2.4 GHz ISM band and using spread spectrum modulation techniques; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&amp;TTE Directive</p> <p>Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements</p> <p>Switches for household and similar fixed electrical installations -- Part 2-1: Particular requirements -- Electronic switches</p> <p>Industry Canada -- technical requirements for low power Devices in the 2400 -- 2483.5 MHz band.</p> <p>Industry Canada -- Land mobile and fixed radio Transmitters and receivers, 27.41 to 960.0 MHz</p> <p>Industry Canada -- 900 MHz narrowband personal communications services</p> <p>Industry Canada -- Low power license-exempt radio 2001 Issue 5 communication devices</p> <p>Scope A1</p> <p>Scope A2</p> <p>Scope A3</p> <p>Scope A4</p> <p>B1</p> <p>B2</p> <p>B3</p> <p>B4</p> <p>(A2LA Cert. 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<p>FCC/OST MP-5 1986</p> <p>GR-1089-CORE: 1997, 1999 issue 2/ 2002 Issue 3</p> <p><i>ANSI EMC Standards</i> ANSI C63.4: 1992, 1999, 2001</p> <p>ANSI C63.5 1988</p> <p><i>IEEE EMC Standards</i> IEEE C62.41: 1980, 1991</p> <p><i>Swedish EMC Standards</i> BAKOM 3336.3 1995</p> <p><i>South African EMC standards other than CISPR equivalents</i> SABS 1718-1: 1996</p> <p><i>Japanese VCCI Standards</i> VCCI V-3/99.05 1999 VCCI V-4/99.05 1999</p> <p><b>Telecommunications</b> 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 (<i>excluding volume control</i>); Protocol analysis and Jitter testing.</p> <p><b>Telecom Standards</b></p> <p>FCC 47 CFR Part 68 Telephone</p> <p>CS-03 Issue 8 1996 through amendment 5</p> <p>TIA/EIA TSB31-B 1998</p> <p>(A2LA Cert. No. 1627-01) 10/31/03</p> <p style="text-align: right;">Page 7 of 11</p>	<p>FCC (Federal Communications Commission) methods Of measurement of radio noise emissions from industrial, scientific and medical equipment.</p> <p>Bellcore electromagnetic compatibility and electrical safety -- Generic criteria for network telecommunications equipment.</p> <p>American National Standard for methods of measurement of radio-noise emissions for low-voltage electrical and electronic equipment in the range of 9 kHz to 40GHz.</p> <p>American National Standard for electromagnetic compatibility -- radiated emissions measurements in electromagnetic interference (EMI) control -- calibration of antennas.</p> <p>IEEE recommended practice on surge voltages in low-voltage AC power circuits</p> <p>Electromagnetic compatibility and electrical safety (EMC &amp; S) for wired terminal equipment. Harmonization document information over the OFCOM requirements.</p> <p>South African Bureau of Standards: Specification for Gaming equipment. Part 1: Casino equipment.</p> <p>Technical Requirements</p> <p>Instruction for Test Conditions for Requirement under Test</p> <p>TIA/EIA-IS-968</p> <p>TIA/EIA-IS-883</p> <p>TIA-968-A</p> <p>T1.TRQ.6-2001</p> <p>Canada VDSL Issue 1 January 2003</p> <p>AS/ACIF S002-2001</p> <p>AS/ACIF S016-2001</p> <p>AS/ACIF S031-2001 AS/ACIF S038-2001 AS/ACIF S043-2001</p> <p>ITU-T G.703 HKTA 2028</p> <p>HKTA 2029</p> <p>TBR 1 : 1995</p> <p>TBR 2 : 1997</p> <p>Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network</p> <p>Telecommunications Telephone Terminal Equipment Supplemental Technical Requirements for Connection of Stutter Dial Tone Detection Devices and ADSL Modems to the Telephone Network</p> <p>Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network</p> <p>Technical Requirements for SHDSL, HDLSL2, HDLSL4 Digital Subscriber Line Terminal Equipment to Prevent Harm to the Telephone Network Industry</p> <p>Terminal Attachment Program Requirements and Test Methods for Very-High-Bit-Rate Digital Subscriber Line (VDSL) Terminal Equipment</p> <p>Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network</p> <p>Requirements for Customer Equipment for connection to hierarchical digital interfaces</p> <p>Requirements for ISDN Basic Access Interface</p> <p>Requirements for ISDN Primary Rate Access Interface</p> <p>Requirements for Customer Equipment for Connection to a Metallic Local Loop Interface of a Telecommunications Network --</p> <p>Part 1: General</p> <p>Part 2: Broadband</p> <p>Part 3: DC, Low Frequency AC and Voiceband</p> <p>Physical/electrical characteristics of hierarchical Digital interfaces</p> <p>Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 1544 kbit/s</p> <p>Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 2048 kbit/s</p> <p>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 signaling rate up to, and including, 1 984 kbit/s</p> <p>Attachment requirements for Data Terminal Equipment (DTE) to connect to Packet Switched Public Data Networks (PSPDNs) for CCITT Recommendation X.25 interfaces at data signaling rates up to 1 920 kbit/s utilizing interfaces derived from CCITT Recommendations X.21 and X.21 bit</p> <p>(A2LA Cert. No. 1627-01)</p> <p style="text-align: right;">10/31/03 Page 8 of 11</p>



<p>TBR 3 : 1995 + Amdt : 1997</p> <p>TBR 4 : 1995 + Amdt : 1997</p> <p>TBR 012 : 1993 + Amdt : 1996</p> <p>TBR 013 : 1996</p> <p>TBR 21 : 1998</p> <p>TBR 24 : 1997</p> <p><i>Australia</i> TS 002 : 1997</p> <p>TS 016 : 1997</p> <p>TS 031 : 1997</p> <p>TS 038 : 1997</p> <p>AS/ACIF S043.2:2001</p> <p><b>Product Safety</b> 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; Over voltage/power cross tests (<i>excluding x-ray tests</i>).</p> <p><u>Product Safety Standards</u></p> <p>Specific Product Safety Standards IEC 950 1991</p> <p>UL 1950 1998</p> <p>CSA C22.2 No.950-95 UL 60950 2000</p> <p>(A2LA Cert. No. 1627-01) 10/31/03</p>	<p>Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access</p> <p>Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN primary rate access</p> <p>Business Telecommunications (BT); Open Network Provision (ONP) technical requirements; 2 048 kbit/s digital unstructured leased line (D2048U) Attachment requirements for terminal equipment</p> <p>Business Telecommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Attachment requirements for terminal equipment interface</p> <p>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</p> <p>Business Telecommunications (BTC); 34 Mbit/s digital Unstructured and structured leased lines (D34U and D34S); Attachment requirements for terminal equipment interface</p> <p>Analogue Interworking and Non interference Requirements for Customer Equipment Connected to the Public Switched Telephone Network</p> <p>General Requirements for Customer Equipment Connected to Hierarchical Digital Interfaces</p> <p>Requirements for ISDN Basic Access Interface</p> <p>Requirements for ISDN Primary Rate Access Interface</p> <p>Requirements for Customer Equipment for connection to a metallic loop interface of a Telecommunications Network – Part 2 Broadband</p> <p><u>Title</u></p> <p>Safety of information technology equipment including Amendments 1, 2, 3, and 4 electrical business equipment.</p> <p>Safety of information technology equipment, including electrical business equipment.</p> <p>Safety of Information Technology Equipment (UL 1950)</p> <p>Safety of information technology equipment</p>	<p>IEC 60950 2000</p> <p>EN 60950 1997, 1998, 2000</p> <p>IEC 60950-1 2001</p> <p>UL 60950-1 2003</p> <p>CSA C22.2 No. 60950-00</p> <p>CSA C22.2 No. 60950-1 03</p> <p>AS/NZS 3260 1993</p> <p>AS/NZS 3260 Supp 1 1996</p> <p>ACA TS 001 1997</p> <p>UL 1459 1995</p> <p>IEC 1010-1 1990</p> <p>IEC 61010-1 1993</p> <p>EN 61010-1 1993, 2001</p> <p>IEC 61010-1 2001</p> <p>UL 61010B-1 2003</p> <p>UL 3101-1 1993</p> <p>CAN/CSA 1010-1 1999 (<i>Including AM 2</i>)</p> <p>UL 3111-1 1996</p> <p>UL 3121-1 1995</p> <p>IEC 60601-1 1995</p> <p>EN 60601-1 1995 (<i>Including AM 2</i>)</p> <p>UL 2601-1 1997</p> <p>IEC 60065 1998, 2000</p> <p>ANSI/UL 6500: 1998</p> <p>CAN/CSA 60065-00</p> <p>AS/NZS 3250 1995</p> <p>AS/NZS 60065 2000</p> <p>Canadian C22.2 No. 1-94 (1-98)</p> <p>1998</p> <p>EN 60065 1994</p> <p>IEC 60825 1990</p> <p>EN 60825-1 1994</p> <p>IEC 60825-1 2001</p> <p>IEC 60825-2 2000-5 systems</p> <p>IEC 60825-4 1997-11</p> <p>IEC 60335-1 1995</p> <p>(<i>Including AM2 – 1997 &amp; AM 12 – 1997</i>)</p> <p>EN 60335-1 2001</p> <p>UL 60335-1 1998</p> <p>CAN/CSA E335-1 1994</p> <p>Safety of information technology equipment</p> <p>Safety of information technology equipment, including Electrical business equipment.</p> <p>Approval and test specification – Safety of information technology equipment including electrical business Equipment.</p> <p>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)</p> <p>Australian Communications Authority – Safety requirements for customer equipment.</p> <p>Telephone Equipment</p> <p>Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements.</p> <p>Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements.</p> <p>Electrical equipment for laboratory use Part 1: General requirements.</p> <p>Electrical measuring and test equipment. Part 1: General requirements.</p> <p>Medical electrical equipment. Part 1: General requirements for safety.</p> <p>Medical electrical equipment. Part 1: General Requirements for safety.</p> <p>Audio, video and similar electronic apparatus – Safety requirements</p> <p>Audio/video and musical instrument apparatus for Household, commercial and similar general use</p> <p>Australian/New Zealand Standard – Approval and test Specification – Mains operated electronic and related Equipment for household and similar general use</p> <p>Audio, video and similar electronic equipment. Consumer and 1994, commercial products</p> <p>Safety requirements for main operated electronic and related apparatus for household and similar general use.</p> <p>Radiation safety of laser products, equipment Classification, requirements and user’s guide</p> <p>Safety of laser products Part 1: equipment Classification, requirements and user’s guide.</p> <p>Safety of laser products – Part 2: Safety of optical communication</p> <p>Safety of laser products – Part 4: Laser guards</p> <p>Safety of household and similar electrical appliances</p> <p>Part 1: General requirements</p>
<p>UL 61010A-1 : 2002</p> <p>EN 61010-1 : 2001</p> <p>AS/NZS 60950 : 2000</p> <p><b>Environmental<sup>2</sup></b></p> <p><u>Environmental Standards</u></p> <p>GR-63-CORE</p> <p>ETS 300 019</p> <p>(vibration up to 1000Hz)</p>	<p>Electrical equipment for laboratory use; part 1: General requirements</p> <p>Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements</p> <p>Safety information technology equipment</p> <p><u>Title</u></p> <p>NEBS Requirements: Physical Protection</p> <p>Environmental conditions and environmental tests For telecommunications equipment</p>	<p>(A2LA Cert. No. 1627-01) 10/31/03</p> <p>Page 9 of 11</p>
<p><sup>2</sup> Environmental testing is performed at the satellite facility located at 168 Ayer Rd, Littleton, MA 01460</p> <p>(A2LA Cert. No. 1627-01) 10/31/03</p>	<p>Page 11 of 11</p>	<p>(A2LA Cert. No. 1627-01) 10/31/03</p> <p>Page 10 of 11</p>

