



Test Report

Report No	EF0550-1
Client	Millennial Net
Phone	781-222-1030
Fax	617-225-0770
FRN	0011054871
Models	EN-5409-ASM
FCC ID IC #	R8N-IB-5209ENC 5127A-IB5209EN
Equipment Type Equipment Code Emission Designator	Low Power Communications Device Transmitter DXX A1D
Results	As detailed within this report
Prepared by	 Josh LeBlanc – Test Engineer
Authorized by	 Michael Buchholz – EMC Manager
Issue Date	8/29/05
Conditions of issue	This Test Report is issued subject to the conditions stated in 'terms and conditions' section of this

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 is an application for certification of a transmitter operating pursuant to 47 CFR 15.249 and RSS-210 6.2 provided for the operation in the band of 902-928MHz. The product covered by this report is the EN-5409-ASM. It is a wireless sensor network endnode that has both a transmitter and receiver which operate at 916.5MHz with a frequency tolerance of $\pm 200\text{kHz}$

Test Methodology

Radiated emissions testing was performed according to the procedures specified in ANSI C63.4 (2003). The EUT was maximized around all three orthogonal axes. The EUT has an integrated antenna which cannot be maximized separately. The EUT is battery powered only. Testing was performed with a fresh battery. The ambient environmental conditions were as follows:

Date	Temperature	Humidity
7/19/05	28.2°C	33%
7/20/05	26.3°C	33%
7/21/05	27.1°C	33%

Frequency range investigated:	30 MHz- 9.166 GHz
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Measurement Distance:		
<i>Frequency (MHz)</i>	<i>Distance (m)</i>	<i>Comments</i>
Fundamental 916.6MHz	3 m	Radiated
Spurious & harmonics 30 – 10000 MHz	3 m	Radiated

EUT Configuration

EUT Configuration	
Work Order:	F0550
Company:	Millennial Net
Company Address:	2 Fourth Ave Burlington, Ma 01803
Contact:	Dave Oswill
Person Present:	Faraz Firoozabadi
EUT:	MN SN
EN-5409-ASM	405210303 used for intentional tests
EN-5409-ASM	405210410 used for spurious tests
terminal board	405210303 used for intentional tests
terminal board	405110017 used for spurious tests
EUT Description:	wireless sensor network endnode
EUT Max Frequency:	916.5MHz
Support Equipment:	MN SN
IBM laptop	G40
Gateway	2G-0006L
	5409-URM-G
405180176	
EUT Cables:	Qty Shielded? Length Ferrites
none	
Unpopulated EUT Ports:	Qty Reason
none	
Software / Operating Mode Description:	
The EUT was set to operate in TX and RX modes.	

Statement of Conformity

The EN-5409-ASM has been found to conform to the following parts of the 47 CFR as detailed below:

RSS-210	47 CFR Part #	Comments
5.7	15.15(b)	The product contains no user accessible controls that increase transmission power above allowable levels.
5.10	15.19	The label is shown in the label exhibit.
5.11	15.21	Information to the user is shown in the instruction manual exhibit.
	15.27	No special accessories are required for compliance.
	15.31(e)	A fresh battery was used for testing.
5.5	15.203	The device uses an integrated antenna.
5.5	15.204	See attached documentation describing the antenna.
6.2.1	15.205 15.209	The fundamental is not in a restricted band and the spurious emissions in the restricted bands comply with the general emission limits of 15.209.
6.6	15.207	The EUT is battery powered with no capability of being connected to the AC mains.
6.2.2	15.249(a)	The EUT meets the field strength limit of 50mV/m (94dB μ V/m) at the fundamental, and 500 μ V/m (54dB μ V/m) at the harmonics.
6.2.1	15.249 (d)	Spurious emissions meet the general radiated emissions limits of section 15.209.
6.2.1	15.249 (e)	Spurious emissions found above 1GHz meet the limits of 15.209.

Modifications required for compliance:

No modifications were required for compliance.

Spurious Radiated Emissions**Sections 15.247(d), 15.205, 15.209, & 6.2.1**

Radiated Emissions Table							Curtis-Straus LLC						
Date: 20-Jul-05			Company: Millenial Net			Work Order: F0550							
Engineer: Josh LeBlanc							EUT Desc: EN-5409-ASM						
Frequency Range: 30-1000MHz							Measurement Distance: 3 m						
Notes: Tested RX and TX with the gateway as support							EUT Max Freq: 916.6MHz						
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dB μ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB μ V/m)	---	Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)			
							FCC Class B						
V	56.75	33.9	22.4	7.7	0.8	20.0	---	40.0	-20.0	Pass			
V	63.15	36.5	22.4	6.8	0.8	21.7	---	40.0	-18.3	Pass			
V	83.6	46.2	22.4	8.3	1.0	33.1	---	40.0	-6.9	Pass			
V	99.8	41.2	22.3	11.3	1.1	31.3	---	43.5	-12.2	Pass			
V	110.73	46.6	22.3	12.2	1.2	37.7	---	43.5	-5.9	Pass			
V	133.73	47.5	22.3	12.6	1.4	39.2	---	43.5	-4.3	Pass			
V	179.1	43.8	22.4	10.0	1.6	33.0	---	43.5	-10.5	Pass			
V	200.84	44.5	22.4	10.7	1.7	34.5	---	43.5	-9.0	Pass			
H	240.8	44.1	22.4	12.6	1.9	36.2	---	46.0	-9.8	Pass			
H	277.8	41.3	22.3	13.5	2.0	34.5	---	46.0	-11.5	Pass			
H	333.0	34.7	22.2	14.8	2.4	29.7	---	46.0	-16.3	Pass			
Table Result: Pass by -4.3 dB							Worst Freq: 133.73 MHz						
Test Site: "F"			Pre-Amp: Blue			Cable: EMIR-01			Analyzer: Yellow				
							Antenna: Grn-Blk						

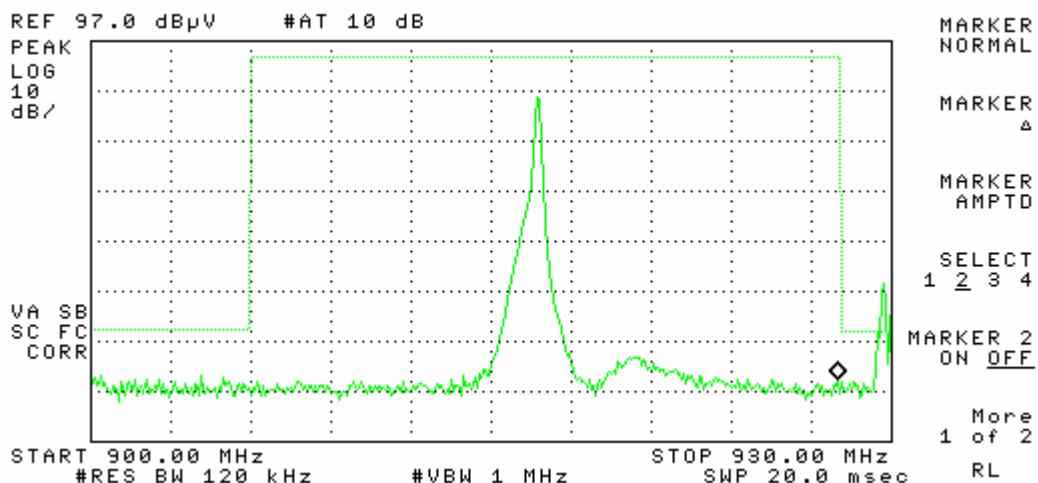
Radiated Emissions Table							Curtis-Straus LLC						
Date: 20-Jul-05			Company: Millenial Net			Work Order: F0550							
Engineer: Josh LeBlanc							EUT Desc: EN-5409-ASM						
Frequency Range: 1-10GHz							Measurement Distance: 3 m						
Notes: Tested RX and TX with gateway as support							EUT Max Freq: 916.6MHz						
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dB μ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB μ V/m)	---	Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)			
							FCC Class B						
No emissions found.							---	---	---	---			
Test Site: "F"			Pre-Amp: White			Cable: 3 RG142LL			Analyzer: Orange				
							Antenna: Orange Horn						

Sample Calculation:

$$\text{Adjusted Reading} = \text{Reading} - \text{Pre Amp}_{(\text{factor})} + \text{Antenna}_{(\text{factor})} + \text{Cable}_{(\text{factor})}$$

Bandedge Plot

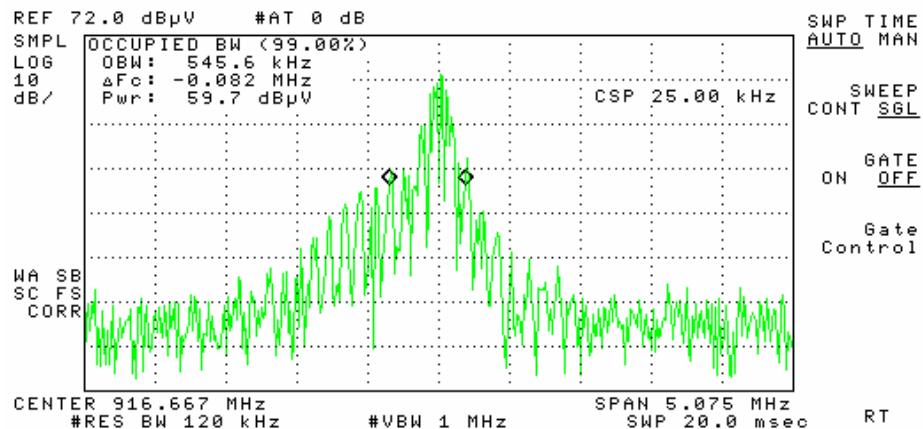
11:38:39 JUL 19, 2005



Conclusion: As seen on the above plot, the fundamental is >10dB below the limit line shown and thus meets the spurious limit at the bandedge

Emission Bandwidth**Section 5.9.1**

11:54:13 JUL 19, 2005



Fundamental and Harmonics Field Strength**Section 15.249(a) & 6.2.2**

Fundamental Emission										Curtis-Straus LLC									
Date: 19-Jul-05 Engineer: Josh LeBlanc			Company: Millennial Net EUT Desc: EN-5409-ASM				Work Order: F0550												
Frequency Range: Fundamental								Measurement Distance: 3 m											
Notes:																			
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dB μ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB μ V/m)	---	Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)						
H	916.685	63.8	0.0	22.9	4.5	91.2	---	---	---	94.0	-2.8	Pass							
Table Result: Pass by -2.4 dB							Worst Freq: 916.685 MHz												
Test Site: "F"			Pre-Amp: none		Cable: EMIR-01		Analyzer: Yellow		Antenna: Red-White										

Harmonic Radiated Emissions Table										Curtis-Straus LLC									
Date: 19-Jul-05 Engineer: Josh LeBlanc			Company: Millennial Net EUT Desc: EN-5409-ASM				Work Order: F0550												
Frequency Range: Harmonics								Measurement Distance: 3 m											
Notes: TX mode																			
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dB μ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB μ V/m)	---	Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)						
H	1833.3	21.8	18.0	30.1	7.4	41.3	---	---	---	54.0	-12.7	Pass							
Table Result: Pass by -12.7 dB							Worst Freq: 1833.3 MHz												
Test Site: "F"			Pre-Amp: Blue		Cable: EMIR-01		Analyzer: Yellow		Antenna: Red-White										

Sample Calculation:

$$\text{Adjusted Reading} = \text{Reading} - \text{Pre Amp}_{(\text{factor})} + \text{Antenna}_{(\text{factor})} + \text{Cable}_{(\text{factor})}$$

AC Line Conducted Emission Measurements**Section 15.207, 6.6 & 9**

AC line conducted emissions was not performed due to the EUT being battery powered only.

Test Equipment Used

REV. 01-JUL-2005

SPECTRUM ANALYZERS / RECEIVERS		RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
YELLOW		9kHz-2.9GHz	8594E	HP	3523A01958	00100	20-APR-2006
ORANGE		9kHz-26.5GHz	E4407B	HP	US39440975	00394	22-JUN-2006
OPEN AREA TEST SITE (OATS)		FCC CODE		IC CODE		VCCI CODE	CALIBRATION DUE
SITE F		93448		IC 2762-F		R-1688	04-APR-2007
PREAMPS / ATTENUATORS / FILTERS		RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
BLUE	0.01-2000MHz	ZFL-1000-LN		C-S	N/A	00759	26-JUL-2005
WHITE	1-20GHz	SMC-12A		C-S	426643	00760	21-JUL-2005
ANTENNAS		RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
RED-WHITE BILOG	30-2000MHz	JB1	SUNOL	A091604-1	01105		28-SEP-2006
ORANGE HORN	1-18GHz	3115	EMCO	0004-6123	00390		09-JUN-2007
METEOROLOGICAL METERS		MN		MFR	SN	ASSET	CALIBRATION DUE
TEMP./HUMIDITY/ATM. PRESSURE GAUGE		7400 PERCEPTION II		DAVIS	N/A	00965	08-FEB-2007
TEMPERATURE /HUMIDITY GAUGE		THG-912		HUGER	4000562	00789	01-FEB-2007
WEATHER CLOCK (PRESSURE ONLY)		BA928		OREGON SCIENTIFIC	C3166-1	00831	02-FEB-2007

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 presentation 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

<p><u>SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999</u></p> <p>CURTIS-STRAU⁵ 527 Great Road Littleton, MA 01460 Barry Quinlan Phone: 978-486-8880</p> <p>ELECTRICAL</p> <p>Valid until: September 30, 2005</p> <p>Certificate Number: 1627-01</p> <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</u> tests:</p> <p>Electromagnetic Compatibility (EMC) Radiated emissions testing (electric and magnetic fields); Conducted emissions testing (voltage and current); Electrostatic Discharge testing; Electrical Fast Transient 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> <p>EMC Standards</p> <table border="0"> <thead> <tr> <th>Title</th> </tr> </thead> <tbody> <tr> <td><i>Emissions</i></td> </tr> <tr> <td>CISPR 22 1997 with amendments 1 and 2</td> <td>Limits and methods of measurement of radio disturbance characteristics of information technology equipment.</td> </tr> <tr> <td>CNS13438 1994</td> <td>Limits and methods of measurement of radio interference characteristics of information technology equipment.</td> </tr> <tr> <td>EN55022:1994 and 1998</td> <td>Limits and methods of measurement of radio disturbance characteristics of information technology equipment.</td> </tr> <tr> <td>SABS CISPR 22:1997</td> <td>Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement</td> </tr> <tr> <td>Canada ICES-003 1997 AS/NZS 3548 1995</td> <td>Digital apparatus Australian/New Zealand Standard Limits and methods of measurement of radio disturbance characteristics of information technology equipment</td> </tr> <tr> <td>CISPR 11 1990, 1997, 1999</td> <td>Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment</td> </tr> </tbody> </table> <p>¹ Note: This accreditation covers testing performed at the laboratory listed above and the satellite facility located at 168 Ayer Rd, Littleton, MA 01460</p>	Title	<i>Emissions</i>	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 AS/NZS 3548 1995	Digital apparatus 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>EN 55011 1991, 1998</p> <p>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 (<i>except discontinuous disturbances</i>)</p> <p>EN 55014 1993, 1997 <i>discontinuous disturbances</i>)</p> <p>AS/NZS 1044: 1995 <i>discontinuous disturbances</i>)</p> <p><i>Immunity</i></p> <p>CNS13783-1 SABS CISPR 14-1 1993</p> <p>SABS CISPR 14-2 1997 + A1:2001</p>
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<p>CISPR 14-2 1996, 1997 + A1:2001</p> <p>CISPR 20: 1995, 2002 with amendment 3 (<i>associated group only</i>)</p> <p>EN 55020: 1995, 2002 (<i>associated group only</i>) CISPR 24</p> <p>SABS CISPR 24 1997</p> <p>AS/NZS 3200.1.2: 1995</p> <p><i>European Union Basic EMC Standards</i> EN 61000-4-2: 1995, 1999, 2001</p> <p>EN 61000-4-3:1997, 1998, 2002 AS/NZS 61000.4.3 1999</p> <p>EN 61000-4-4 1995</p> <p>EN 61000-4-5 1995 AS/NZS 61000.4.5 1999 EN 61000-4-6 1996 AS/NZS 61000.4.6 1999</p> <p>EN 61000-4-8 1994</p> <p>EN 61000-4-11 1994</p> <p>ENV 61000-2-2 1993</p> <p><i>EU Product Family Standards</i> EN 50081-1 1992</p> <p>EN 50081-2 1993</p> <p>EN 50082-1 1992, 1998</p> <p>EN 50082-2 1995</p>	<p>EN 61000-6-1: 1997, 2001</p> <p>EN 61000-6-2: 1998, 2001</p> <p>EN 50091-2 1996</p> <p>EN 55024 1998</p> <p>EN 55103-1 1997</p> <p>EN 55103-2 1997 (<i>excluding Annex A3</i>)</p> <p>EN 61326 1998</p> <p>EN 61547 1996</p> <p>EN 50130-4 1996</p> <p>EN 55104 1995</p> <p>EN 50083-2 1995</p> <p>EN 60601-1-2: 1993, 2002</p> <p>IEC 1800-3 1995</p> <p>EN 60555 Part 2 1987</p> <p>EN 60555 Part 3 1987</p> <p>EN 61000-3-2: 1995, 2000 AS/NZS 61000.3.2 1998</p> <p>EN 61000-3-3 1995 AS/NZS 61000.3.3 1999</p> <p>ETS 300 386-1 1994</p> <p>Electromagnetic Compatibility (EMC) – Generic emission standard. Part 1: Residential, commercial and light industry. (I.S.)</p> <p>Electromagnetic compatibility – Generic emission standard. Part 2: Industrial environment</p> <p>Electromagnetic compatibility – Generic emission standard. Part 1: Residential, commercial and light industry</p> <p>Electromagnetic compatibility – Generic immunity Standard. Part 2: Industrial environment</p>														
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ETS EN 300 386-2 1997, 1998, ETS EN 300 386 2000 v1.2.1, 2001 v1.3.1	Electromagnetic compatibility and radio spectrum matters (ERM); Telecommunication network equipment; Electromagnetic compatibility (EMC) requirements; Part 2: Product family standard.	EN 300 328-2:2001 v1.2.1	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&TTE Directive
ETS 300 132-1 1996	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	EN 301 489-1:2002	Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
ETS 300 132-2 1996	Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc)	EN 60669-2-1:2002	Switches for household and similar fixed electrical installations -- Part 2-1: Particular requirements -- Electronic switches
ETR 283 1997	Equipment Engineering (EE); Transient voltages at Interface A on telecommunications direct current (DC) power distributions.	<i>Canada Radio Standards</i> Canadian GL-36 1995	
<i>EU radio standards</i> (ETSI EN 300 385 v1.2.1: 1998, 1999	Electromagnetic compatibility and Radio spectrum matters (ERM); Electromagnetic Compatibility (EMC) standard for fixed radio links and ancillary equipment (ETSI)	Canadian RSS-119 1999, 2000 Issue 6	Industry Canada – technical requirements for low power Devices in the 2400 – 2483.5 MHz band.
EN 300 330 v1.2.1: 1998, 1999	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.	Canadian RSS-134 1996 & 2000, Issue 1 Rev 1	Industry Canada – Land mobile and fixed radio Transmitters and receivers, 27.41 to 900.0 MHz services
ETS 300 328 1996	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	Canadian RSS-210 2000 Issue 3, RFS29 1998	Industry Canada – Low power license-exempt radio 2001 Issue 5 communication devices Specification for Restricted Radiation Radio Apparatus (New Zealand)
ETS EN 300 440 v1.2.1 1999	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	<i>FCC Standards</i>	
EN 301 893:2002 v1.2.1	Broadband Radio Access Networks (BRAN); 5 GHz (draft) high performance RLAN; Harmonized EN covering Essential requirements of article 3.2 of the R&TTE Directive	47 CFR FCC low power transmitters operating on frequencies below 1 GHz, emergency alert systems, unintentional radiators and ISM devices.	Scope A1
ETS 300 836-1:1998	Broadband Radio Access Networks (BRAN); High Performance Radio Local Area Network (HIPERLAN) Type I; Conformance testing specification; Part 1: Radio Type approval and Radio Frequency (RF) conformance test specification	47 CFR FCC low power transmitters operating on frequencies above 1 GHz, with the exception of spread spectrum devices.	Scope A2
EN301 489-17:2002 v1.2.1	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	47 CFR FCC Unlicensed Personal Scope Communications System (PCS) devices 47 CFR FCC Unlicensed National Scope Information Infrastructure devices and low power transmitters using spread spectrum techniques.	A3
		47 CFR FCC Personal mobile Scope Radio Services in the following FCC Rule Parts 22, 24, 25, 27.	A4
		47 CFR FCC General Mobile Radio Scope Services in the following FCC Rule Parts 22, 74, 90, 95, 97.	B2
		47 CFR FCC Maritime and Aviation Scope RadioServices in 47 CFR Parts 80 and 87	B3
		47 CFR FCC Microwave Radio Services Scope in 47 CFR Parts 21, 74 and 101.	B4
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FCC/OST MP-5 1986	FCC (Federal Communications Commission) methods Of measurement of radio noise emissions from industrial, scientific and medical equipment.	TIA/EIA-IS-968	Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network
GR-1089-CORE: 1997, 1999 issue 2/ 2002 Issue 3	Bellcore electromagnetic compatibility and electrical safety – Generic criteria for network telecommunications equipment.	TIA/EIA-IS-883	Telecommunications Telephone Terminal Equipment Supplemental Technical Requirements for Connection of Stutter Dial Tone Detection Devices and ADSL Modems to the Telephone Network
<i>ANSI EMC Standards</i> ANSI C63.4: 1992, 1999, 2001, 2003	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.	TIA-968-A	Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network
ANSI C63.5 1988	American National Standard for electromagnetic compatibility – radiated emissions measurements in electromagnetic interference (EMI) control – calibration of antennas.	T1.TRQ.6-2001	Technical Requirements for SHDSL, HDSL2, HDSL4 Digital Subscriber Line Terminal Equipment to Prevent Harm to the Telephone Network Industry
<i>IEEE EMC Standards</i> IEEE C62.41: 1980, 1991	IEEE recommended practice on surge voltages in low-voltage AC power circuits	Canada VDSL Issue 1 January 2003	Terminal Attachment Program Requirements and Test Methods for Very-High-Bit-Rate Digital Subscriber Line (VDSL) Terminal Equipment
<i>Swedish EMC Standards</i> BAKOM 3336.3 1995	Electromagnetic compatibility and electrical safety (EMC & S) for wired terminal equipment. Harmonization document information over the OFCOM requirements.	AS/ACIF S002-2001	Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network
<i>South African EMC standards other than CISPR equivalents</i> SABS 1718-1: 1996	South African Bureau of Standards: Specification for Gaming equipment. Part 1: Casino equipment.	AS/ACIF S016-2001	Requirements for Customer Equipment for connection to hierarchical digital interfaces
<i>Japanese VCCI Standards</i> VCCI V-3/99.05 1999 VCCI V-4/99.05 1999	Technical Requirements Instruction for Test Conditions for Requirement under Test	AS/ACIF S031-2001 AS/ACIF S038-2001 AS/ACIF S043-2001	Requirements for ISDN Basic Access Interface Requirements for ISDN Primary Rate Access Interface Requirements for Customer Equipment for Connection to a Metallic Local Loop Interface of a Telecommunications Network — Part 1: General Part 2: Broadband
<i>Telecommunications</i>	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.	ITU-T G.703 HKTA 2028 HKTA 2029 TBR 1 : 1995	Part 3: DC, Low Frequency AC and Voiceband Physical/electrical characteristics of hierarchical Digital interfaces Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 1544 kbit/s Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 2048 kbit/s 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
<i>Telecom Standards</i>	Title	TBR 2 : 1997	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.
FCC 47 CFR Part 68 Telephone	Connection of terminal equipment to the telephone Terminal Equipment network. Analog and Digital Equipment. TCB Scope C1.		
CS-03 Issue 8 1996 through amendment 5	Specification for terminal equipment, terminal systems, Network protection devices, connection arrangements and hearing aids compatibility.		
TIA/EIA TSB31-B 1998	Bulletin Part 68 Rationale and Measurement Guidelines (Feb 1998)		
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TBR 3 : 1995 + Amdt : 1997	Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access	IEC 60950 2000 EN 60950 1997, 1998, 2000 IEC 60950-1 2001 UL 60950-1 2003 CSA C22.2 No. 60950-00 CSA C22.2 No. 60950-1 03 AS/NZS 3260 1993	Safety of information technology equipment Safety of information technology equipment, including Electrical business equipment.
TBR 4 : 1995 + Amdt : 1997	Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN primary rate access		
TBR 012 : 1993 + Amdt : 1996	Business Telecommunications (BT); Open Network Provision (ONP) technical requirements; 2 048 kbit/s digital unstructured leased line (D2048U) Attachment requirements for terminal equipment	AS/NZS 3260 Supp 1 1996	Approval and test specification – Safety of information technology equipment including electrical business Equipment.
TBR 013 : 1996	Business TeleCommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Attachment requirements for terminal equipment interface	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) Australian Communications Authority – Safety requirements for customer equipment.
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	UL 1459 1995 IEC 1010-1 1990 IEC 61010-1 1993 EN 61010-1 1993, 2001 IEC 61010-1 2001 UL 61010B-1 2003 UL 3101-1 1993 CAN/CSA 1010-1 1999 (<i>Including AM 2</i>) UL 3111-1 1996 UL 3121-1 1995 IEC 60601-1 1995 EN 60601-1 1995 (<i>Including AM 2</i>) UL 2601-1 1997 IEC 60065 1998, 2000 ANSI/UL 6500: 1998 CAN/CSA 60065-00 AS/NZS 3250 1995 AS/NZS 60065 2000	Telephone Equipment Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements. Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements.
TBR 24 : 1997	Business TeleCommunications (BTC); 34 Mbit/s digital Unstructured and structured leased lines (D34U and D34S); Attachment requirements for terminal equipment interface	UL 3101-1 1993 CAN/CSA 1010-1 1999 (<i>Including AM 2</i>) UL 3111-1 1996 UL 3121-1 1995 IEC 60601-1 1995 EN 60601-1 1995 (<i>Including AM 2</i>) UL 2601-1 1997 IEC 60065 1998, 2000 ANSI/UL 6500: 1998 CAN/CSA 60065-00 AS/NZS 3250 1995 AS/NZS 60065 2000	Electrical equipment for laboratory use Part 1: General requirements. Electrical measuring and test equipment. Part 1: General requirements.
<i>Australia</i>			Medical electrical equipment. Part 1: General requirements for safety.
TS 002 : 1997	Analogue Interworking and Non interference Requirements for Customer Equipment Connected to the Public Switched Telephone Network	IEC 60601-1 1995 EN 60601-1 1995 (<i>Including AM 2</i>) UL 2601-1 1997 IEC 60065 1998, 2000 ANSI/UL 6500: 1998 CAN/CSA 60065-00 AS/NZS 3250 1995 AS/NZS 60065 2000	Medical electrical equipment Medical electrical equipment. Part 1: General Requirements for safety.
TS 016 : 1997	General Requirements for Customer Equipment Connected to Hierarchical Digital Interfaces	IEC 60825 1990	Audio, video and similar electronic apparatus – Safety requirements Audio/video and musical instrument apparatus for Household, commercial and similar general use
TS 031 : 1997	Requirements for ISDN Basic Access Interface	EN 60825-1 1994	Australian/New Zealand Standard – Approval and test
TS 038 : 1997	Requirements for ISDN Primary Rate Access Interface	IEC 60825-1 2001	Specification – Mains operated electronic and related Equipment for household and similar general use
AS/ACIF S043.2:2001	Requirements for Customer Equipment for connection to a metallic loop interface of a Telecommunications Network – Part 2 Broadband	IEC 60825-2 2000-5	Audio, video and similar electronic equipment. Consumer and 1994, commercial products
<i>Product Safety</i>	Title		Safety requirements for main operated electronic and related apparatus for household and similar general use.
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>).			Radiation safety of laser products, equipment Classification, requirements and user's guide.
Product Safety Standards			Safety of laser products Part 1: equipment Classification, requirements and user's guide.
Specific Product Safety Standards			Safety of laser products – Part 2: Safety of optical communication systems
IEC 950 1991	Safety of information technology equipment including Includes Amendments 1, 2, 3, and 4 electrical business equipment.	IEC 60825-4 1997-11	Safety of laser products – Part 4: Laser guards
UL 1950 1998	Safety of information technology equipment, including electrical business equipment.	IEC 60335-1 1995 (<i>Including AM2 – 1997 & AM 12 – 1997</i>)	Safety of household and similar electrical appliances
CSA C22.2 No.950-95	Safety of Information Technology Equipment (UL 1950)	EN 60335-1 2001	Part 1: General requirements
UL 60950 2000	Safety of information technology equipment	UL 60335-1 1998	
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UL 61010A-1 : 2002	Electrical equipment for laboratory use; part 1: General requirements		
EN 61010-1 : 2001	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements		
AS/NZS 60950 : 2000	Safety information technology equipment		
<i>Environmental</i> ²	Title		
<i>Environmental Standards</i>			
GR-63-CORE	NEBS Requirements: Physical Protection		
ETS 300 019	Environmental conditions and environmental tests For telecommunications equipment		
(vibration up to 1000Hz)			

² Environmental testing is performed at the satellite facility located at 168 Ayer Rd, Littleton, MA 01460