



Test Report

Report No	ED0859-1
Client	Ember 313 Congress Street 4 th Floor Boston, MA 02210 (617) 951-0200 (617) 951-0999 0007644552
Phone	
Fax	
FRN	
Model	110-0019-002
FCC ID	QML-EK1020CON
Equipment Type	Low Power Communication Device Transmitter
Equipment Code	DXX
Results	As detailed within this report
Prepared by	 Evan Gould – Test Engineer
Authorized by	 Michael Buchholz – EMC Manager
Issue Date	4/14/04
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.

Curtis-Straus LLC • 527 Great Road • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8828



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Summary

This test report supports an application for certification of a transmitter operating pursuant to 47 CFR 15.249. The product is the EM1020 Evaluation Kit Board (Model 110-0019-002). It is a transmitter that operates in the range 902-928MHz.

Test Methodology

Radiated emissions testing is performed according to the procedures specified in ANSI C63.4 (2002).

Frequency range investigated: 0.15MHz – 10GHz

Measurement distance:	0.15 - 30MHz	Conducted
	30 - 1000MHz	3m
	1 – 10GHz	3m

AC Line conducted emissions testing was performed with a 50Ω/50µH LISN.

Statement of Conformity

The EM1020 has been found to conform to the following parts of 47 CFR as detailed below:

Part 2	Part 15	Comments
	15.15(b)	The controls that adjust the power level on this device are accessible to the user and the EUT was tested at the highest power level.
2.925	15.19	The label is shown in the label exhibit.
	15.21	Information to the user is shown in the instruction manual exhibit.
	15.27	No special accessories are required for compliance.
	15.203	The antenna connector is a reverse SMA type connector.
	15.205 15.209	The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209.
	15.207	The unit meets the AC conducted emissions requirements of 15.207.
	15.249	The unit complies with the requirements of 15.249

EUT Configuration

EUT Configuration							
Work Order: D0859							
Company: Ember Corporation							
Company Address: 313 Congress Street, 4th Floor Boston, MA 02210							
Contact: John Loukota							
MN	SN	FCC ID					
EUT: 110-0019-002	000D6F0000000242	QML-EK1020CON					
EUT Max Frequency: 927.49MHz							
Support Equipment:	MN	SN	FCC ID				
CUI Inc. AC adaptor	35-3.3-300R	-	-				
EUT Cables:	Qty	Shielded?	Length	Ferrites			
Cat.5	1	No	5ft	No			
DC power	1	No	6ft	No			
Unpopulated EUT Ports:	Qty	Reason					
none							
Software / Operating Mode Description:							
EUT able to be set to transmit both modulated and unmodulated data at channels 0-48.							

Fundamental Frequency Measurement

LIMIT

Average: $50\text{mV/m} = 93.9\text{dB}\mu\text{V/m}$ @ 3m [15.249(a)]

Peak: $93.9\text{dB}\mu\text{V/m} + 20\text{dB} = 113.9\text{dB}\mu\text{V}$ @ 3m [15.249(d)]

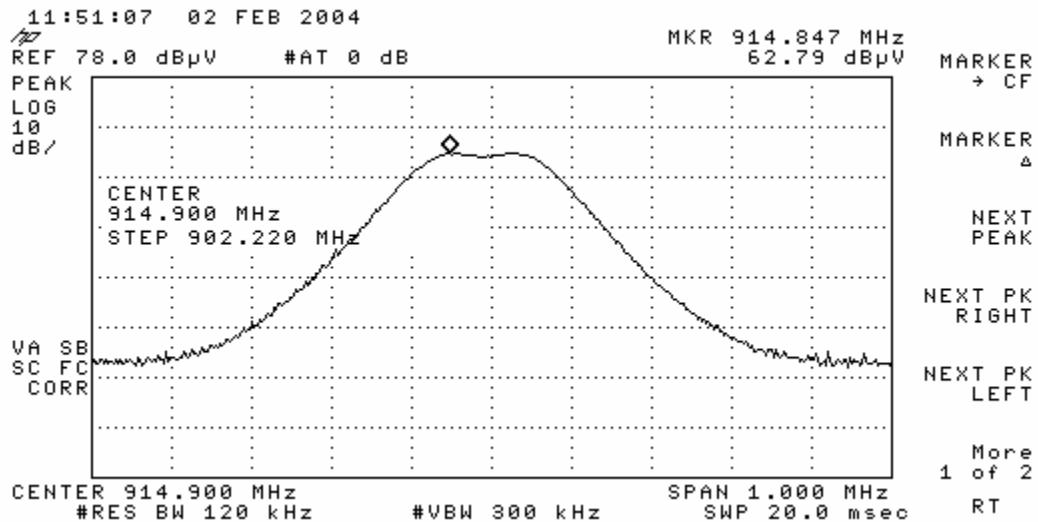
Note: If Peak measurements meet Average limits, then Average measurements are not required.

MEASUREMENTS

Fundamental

Curtis-Straus LLC									
Date: 02-Feb-04			Company: Ember		Work Order: D0859				
Engineer: Mairaj Hussain			EUT Desc: EM1020		Measurement Distance: 3 m				
Notes: Modulated signal Tx Power: -1dBm (hex 13)					EUT Max Freq: 927.49MHz				
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)	FCC 15.249(a)		
							Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)
Ch 01 Vpk	902.81	65.4	0.0	21.6	5.0	92.0	93.9	-1.9	Pass
Ch 12 Hpk	908.54	65.1	0.0	21.6	5.0	91.7	93.9	-2.2	Pass
Ch 24 Hpk	914.84	62.8	0.0	21.7	5.0	89.5	93.9	-4.4	Pass
CH 48 Hpk	927.49	64.6	0.0	21.8	5.0	91.4	93.0	-1.6	Marginal
Table Result: Pass			by -1.6 dB		Worst Freq: 927.49 MHz				
Test Site: "T"		Pre-Amp: none	Cable: 65 ft RG8A/U		Analyzer: White	Antenna: Green			

SAMPLE ANALYZER PLOT



Band Edge Measurements

LIMITS

Average: 50dB below level of Fundamental **OR**

General radiated emission limits of 15.209

“...whichever is the lesser attenuation.” [15.249(c)]

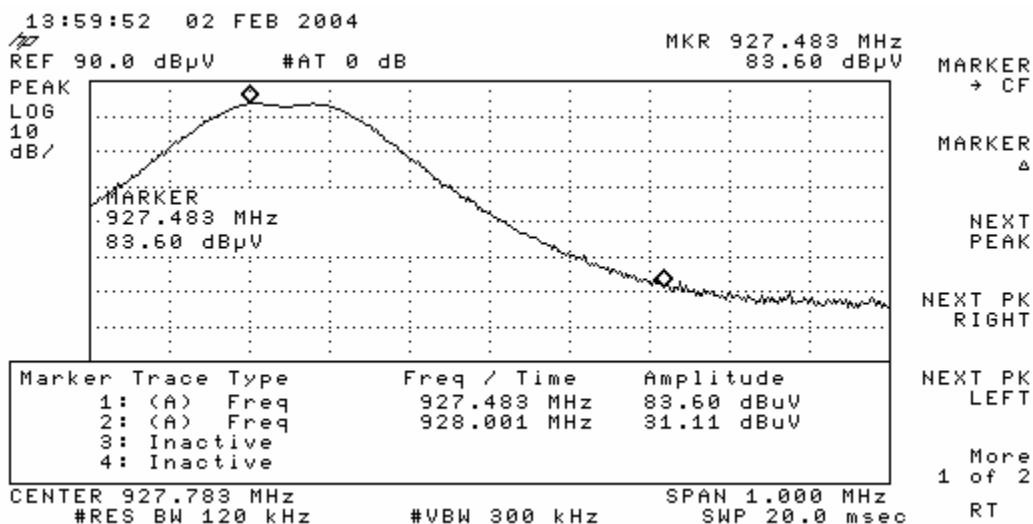
Peak: (Average limit) + 20dB [15.249(d)]

Note: If Peak measurements meet Average limits, then Average measurements are not required.

MEASUREMENTS

Band Edges								Curtis-Straus LLC							
Date: 02-Feb-04			Company: Ember			Work Order: D0859									
Engineer: Mairaj Hussain			EUT Desc: em1020												
Measurement Distance: 3 m															
Notes: EUT Max Freq: 927.49MHz															
Antenna	Frequency	Reading	Preamp	Antenna	Cable	Adjusted	47 CFR 15.209(a)								
Polarization	(MHz)	(dB μ V)	Factor	Factor	Factor	Reading	Limit	Margin	Result						
(H / V)			(dB)	(dB/m)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	(Pass/Fail)						
Hpk	928.0	31.1	19.7	21.8	5.0	38.2	46.0	-7.8	Pass						
Hpk	902.0	29.4	19.8	21.6	4.9	36.1	46.0	-9.9	Pass						
Table Result: Pass by -7.8 dB								Worst Freq: 928.0 MHz							
Test Site: "T"	Pre-Amp: Green		Cable: 65 ft RG8A/U		Analyzer: White		Antenna: Green								

SAMPLE ANALYZER PLOT



Spurious Emissions

LIMITS

Average: 50dB below level of Fundamental **OR**

General radiated emission limits of 15.209

“...whichever is the lesser attenuation.” [15.249(c)]

Peak: (Average limit) + 20dB [15.249(d)]

Note: If Peak measurements meet Average limits, then Average measurements are not required.

MEASUREMENTS

Spurious Emissions

Curtis-Straus LLC

Date: 02-Feb-04	Company: Ember	Work Order: D0859							
Engineer: Mairaj Hussain	EUT Desc: EM1020								
Frequency Range: 30 - 1000MHz		Measurement Distance: 3 m							
Notes: EUT Max Freq: 927.49MHz									
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)	47 CFR 15.209(a)		
							Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)
H	897.0	34.5	19.8	21.5	4.9	41.1	46.0	-4.9	Pass
H	309.5	31.3	20.3	14.1	2.5	27.6	46.0	-18.4	Pass
H	280.1	30.5	20.3	13.6	2.3	26.1	46.0	-19.9	Pass
Table Result: Pass by -4.9 dB		Worst Freq: 897.0 MHz							
Test Site: "T"	Pre-Amp: Green	Cable: 65 ft RG8A/U	Analyzer: White	Antenna: Grn-Blk					

Harmonics/Spurious Emissions

Curtis-Straus LLC

Date: 02-Feb-04	Company: Ember	Work Order: D0859							
Engineer: Mairaj Hussain	EUT Desc: em1020								
Frequency Range: 1 - 10 GHz		Measurement Distance: 3 m							
Notes: EUT Max Freq: 927.49MHz									
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)	47 CFR 15.209(a)		
							Limit (dB μ V/m)	Margin (dB)	Result (Pass/Fail)
Vpk	1805.4	42.4	18.2	28.9	1.7	54.8	74.0	-19.2	Pass
10Hz Vpk	1805.4	40.9	18.2	28.9	1.7	53.3	54.0	-0.7	Pass
Vpk	2708.0	30.5	17.4	31.5	2.0	46.6	54.0	-7.4	Pass
Table Result: Pass by -0.7 dB		Worst Freq: 1805.4 MHz							
Test Site: "T"	Pre-Amp: White	Cable: 2 RG142LL	Analyzer: White	Antenna: Black Horn					

AC Line Conducted Emission Measurements**LIMITS**

Frequency of emission (MHz)	Quasi-peak limit (dB μ V)	Average limit (dB μ V)
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

[47 CFR 15.207(a)]

MEASUREMENTS**AC Mains Conducted Emissions**

Curtis-Straus LLC

Date: 04-Feb-04		Company: Ember		Work Order: D0859					
Engineer: Mairaj Hussain		EUT Desc: EM1020		Test Site: EMI1					
Notes:									
LISN(s): Red Yellow-Black		Other Equipment: ---							
Range: 0.15-30Mhz		Spectrum Analyzer: Red							
Frequency (MHz)	Q.P. Readings		Ave. Readings		Impedance Factor	---		Overall Result (Pass/Fail)	
	QP1 (dB μ V)	QP2 (dB μ V)	AV1 (dB μ V)	AV2 (dB μ V)	(dB)	Limit (dB μ V)	Margin dB		
0.15	14.0	14.7			20.0	---	---	Pass	
0.30	10.2	9.8			20.0	---	60.2	Pass	
0.45	2.0	0.0			20.0	---	56.9	Pass	
5.57	1.5	3.0			20.0	---	60.0	Pass	
8.80	5.0	5.0			20.0	---	60.0	Pass	
9.57	3.0	6.7			20.0	---	60.0	Pass	
10.30	5.0	7.0			20.0	---	60.0	Pass	
12.15	7.7	9.0			20.0	---	60.0	Pass	
13.04	7.2	11.3			20.0	---	60.0	Pass	
14.71	10.5	14.4			20.0	---	60.0	Pass	
16.93	15.5	19.0			20.0	---	60.0	Pass	
30.00	19.2	18.7			20.0	---	60.0	Pass	
Table Result:		Pass	by	-10.80 dB		Worst Freq:		30.00 MHz	

Voltage Variation

REQUIREMENT

“For intentional radiators, measurements of the variation of the...radiated signal level of the fundamental frequency component of the emission...shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.”
[15.31(e)]

MEASUREMENTS

15.31(e) Voltage Variation				
Work Order: D0859				
Date(s): 2/4/2004				
Engineer: Mairaj Hussain				
EUT: EM1020				
Company: Ember				
Test Equipment Used:				
Spectrum Analyzer: Red				
Temp: 24.4°C	Humidity: 19%	Pressure: 1009mbar		
AC side				
Nominal 120				
	Vol (V)	Freq (MHz)	Amp (dBuV)	Δ (dBuV)
	102	902.817	80.2	0
	120	902.82	80.2	0
	138	902.752	80.2	0
DC Side				
Nominal 3.3V				
	Vol (V)	Freq (MHz)	Amp (dBuV)	Δ (dBuV)
	2.805	902.822	80.25	0.02
	3.3	902.82	80.27	-
	3.795	902.817	80.23	0.04

Test Equipment Used

REV. 2/2/04

SPECTRUM ANALYZERS		RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
RED		9kHz-1.8GHz	8591E	HP	3441A03559	00024	21-MAY-2004
WHITE		9kHz-22GHz	8593E	HP	3547U01252	00022	25-FEB-2004
LISNs/MEASUREMENT PROBES		RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
RED		10kHz-30MHz	8012-50-R-24-BNC	SOLAR	956348	00753	01-APR-2004
YELLOW-BLACK		10kHz-30MHz	8012-50-R-24-BNC	SOLAR	984735	00248	01-APR-2004
OPEN AREA TEST SITE (OATS)		FCC CODE		IC CODE	VCCI CODE	CALIBRATION DUE	
SITE T		93448		IC 2762-T	R-905	25-MAR-2005	
LINE CONDUCTED TEST SITES		FCC CODE		IC CODE	VCCI CODE	CALIBRATION DUE	
EMI 1		93448		N/A	C-1801	01-MAY-2006	
ANTENNAS		RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
GREEN BILOG	30MHz-2GHz	CBL6112B	CHASE	2742	00620		06-JAN-2006
GREEN-BLACK BILOG	30MHz-2GHz	CBL6112B	CHASE	2412	00127		06-JAN-2006
BLACK HORN	1-18GHz	3115	EMCO	9703-5148	00056		12-JUN-2005
PREAMPS / ATTENUATORS / FILTERS		RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
GREEN	0.01-2000MHz	ZFL-1000-LN	C-S	N/A	00802	17-MAR-2004	
WHITE	1-20GHz	SMC-12A	C-S	426643	00760		29-JUL-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 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-STRAUSS¹ 527 Great Road Littleton, MA 01460 Barry Quinlan Phone: 978-486-8880</p> <p>ELECTRICAL</p> <p>Valid until: July 31, 2005</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)</u>, <u>Telecommunications</u>, and <u>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; 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> <table border="1"> <thead> <tr> <th>EMC Standards</th><th>Title</th></tr> </thead> <tbody> <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>		EMC Standards	Title	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.	
EMC Standards	Title															
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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 (<i>associated group only</i>)	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 (<i>associated group only</i>) CISPR 24	Electromagnetic immunity of broadcast receivers and Associated equipment	EN 50091-2 1996	Specification for Uninterruptible Power Systems (UPS). Part 2: EMC requirements													
SABS CISPR 24 1997	Information technology equipment – Immunity characteristics – Limits and methods of measurement	EN 55024 1998	Information technology equipment – Immunity Characteristics – Limits and methods of measurement.													
AS/NZS 3200.1.2: 1995	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													
<i>European Union Basic EMC Standards</i> EN 61000-4-2: 1995, 1999, 2001	Approval and test specification – Medical electrical Equipment – General requirements for safety – Collateral Standard: Electromagnetic compatibility – Requirements and tests.	EN 55103-2 1997 (<i>excluding Annex A3</i>)	Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control professional use. Part 2: Immunity													
EN 61000-4-3:1997, 1998, 2002 AS/NZS 61000.4.3 1999	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 2: Electrostatic discharge immunity test – Basic EMC Publication	EN 61326 1998	Electrical equipment for measurement, control and laboratory use – EMC requirements													
EN 61000-4-4 1995	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 3: Radiated, radio-frequency, electromagnetic field immunity test	EN 61547 1996	Equipment for general lighting purposes – EMC immunity requirements													
EN 61000-4-5 1995 AS/NZS 61000.4.5 1999	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 4: Surge 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 61000-4-6 1996 AS/NZS 61000.4.6 1999	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 5: Surge immunity test.	EN 55104 1995	Electromagnetic compatibility immunity – requirements for household appliances, tools and similar apparatus. Product family standard.													
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 50083-2 1995	Cabled distribution systems for television and sound signals. Part 2: Electromagnetic compatibility for equipment.													
EN 61000-4-11 1994	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 7: Power frequency magnetic field immunity test.	EN 60601-1-2: 1993, 2002	Medical electrical equipment Part 1: general requirements for safety Section 2: Collateral standard: Electromagnetic compatibility – requirements and tests													
ENV 61000-2-2 1993	(EMC) Part 4: Testing and measurement techniques. Section 11: Voltage dips, short interruptions and voltage Variations immunity tests.	IEC 1800-3 1995	Adjustable speed electrical power drive systems. Part 3: EMC product standard including specific test methods.													
<i>EU Product Family Standards</i> EN 50081-1 1992	Electromagnetic compatibility – Generic emission standard. Part 1: Residential, commercial and light industry. (I.S.)	EN 60555 Part 2 1987	Disturbances in supply systems caused by household appliances and similar electrical equipment. Part 2: Harmonics													
EN 50081-2 1993	Electromagnetic compatibility – Generic emission standard. Part 2: Industrial environment	EN 60555 Part 3 1987	Disturbances in supply systems caused by household appliances and similar electrical equipment. Part 3: Voltage fluctuations.													
EN 50082-1 1992, 1998	Electromagnetic compatibility – Generic emission standard. Part 1: Residential, commercial and light industry	EN 61000-3-2: 1995, 2000 AS/NZS 61000.3.2 1998	Electromagnetic compatibility (EMC). Part 3: Limits Section 2: Limits for harmonic current emissions													
EN 50082-2 1995	Electromagnetic compatibility – Generic immunity Standard. Part 2: Industrial environment	EN 61000-3-3 1995 AS/NZS 61000.3.3 1999	Electromagnetic compatibility (EMC). Part 3: Limits Section 2: Limitation of voltage fluctuations and flicker in low-voltage supply systems.													
(A2LA Cert. No. 1627-01) 10/31/03	Page 3 of 11	ETS 300 386-1 1994	Equipment Engineering (EE): Public telecommunication network equipment electro-magnetic compatibility (EMC) requirements Part 1: Product family overview, compliance criteria and test levels													
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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 Rev 1	Industry Canada - Land mobile and fixed radio Transmitters and receivers, 27.41 to 960.0 MHz
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,	Industry Canada - Low power license-exempt radio 2001 Issue 5 communication devices
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	RFS29 1998	Specification for Restricted Radiation Radio Apparatus (New Zealand)
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	<i>FCC Standards</i>	
ETS 300 836-1:1998	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	47 CFR FCC low power transmitters operating on frequencies below 1 GHz, emergency alert systems, unintentional radiators and ISM devices.	Scope A1
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 low power transmitters operating on frequencies above 1 GHz, with the exception of spread spectrum devices.	Scope A2
(A2LA Cert. No. 1627-01) 10/31/03	Page 5 of 11	47 CFR FCC Unlicensed Personal Scope Communications System (PCS) devices	A3
		47 CFR FCC Unlicensed National Scope	A4
		Information Infrastructure devices and low power transmitters using spread spectrum techniques.	
		47 CFR FCC Personal mobile Scope Radio Services in the following FCC Rule Parts 22, 24, 25, 27.	B1
		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	B4
		Scope in 47 CFR Parts 21, 74 and 101.	
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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 Technical Equipment to the Telephone	Telecommunications Telephone Terminal Equipment Requirements for Connection of Terminal 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 Supplemental Dial Tone Detection	Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Stutter Network
<i>ANSI EMC Standards</i> ANSI C63.4: 1992, 1999, 2001	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 Technical Equipment to the Telephone T1-TQ.6-2001 Digital	Devices and ADSL Modems to the Telephone Network Telecommunications Telephone Terminal Equipment Requirements for Connection of Terminal Network
ANSI C63.5 1988	American National Standard for electromagnetic compatibility - radiated emissions measurements in electromagnetic interference (EMI) control - calibration of antennas.	Harm to the Telephone Canada VDSL Test Methods for Issue 1 January 2003 Subscriber Line (VDSL) Terminal	Technical Requirements for SHDSL, HDSL2, HDSL4 Subscribers Line Terminal Equipment to Prevent Network Industry Terminal Attachment Program Requirements and Very-High- Bit-Rate Digital
<i>IEEE EMC Standards</i> IEEE C62.41: 1980, 1991	IEEE recommended practice on surge voltages in low-voltage AC power circuits	AS/ACIF S002-2001 requirements for Switched Telephone	Analogue interworking and non-interference Customer Equipment for connection to the Public Network
<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 S016-2001 connection to hierarchical AS/ACIF S031-2001 Interface	Requirements for Customer Equipment for digital interfaces
<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 S038-2001 Connection to a Metallic Network -	Requirements for ISDN Basic Access Interface Requirements for ISDN Primary Rate Access
<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	ITU-T G.703 hierarchical Digital interfaces	Requirements for Customer Equipment for Local Loop Interface of a Telecommunications Network
<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.	HKTA 2028 of CPE to the PTNs in rate of 1544 kbit/s	Part 1: General Part 2: Broadband Part 3: DC, Low Frequency AC and Voiceband Physical/electrical characteristics of
Telecom Standards	Title	HKTA 2029 of CPE to the PTNs in rate of 2048 kbit/s	Network connection specification for connection Hong Kong using digital leased circuits at data
FCC 47 CFR Part 68 Telephone	Connection of terminal equipment to the telephone Terminal Equipment network. Analog and Digital Equipment. TCB Scope C1.	TBR 1 : 1995 to be connected to circuits using a CCITT interface physically, CCITT Recommendation to, and including,	Attachment requirements for terminal equipment circuit switched data networks and leased Recommendation X.21 interface, or at an functionally and electrically compatible with X.21 but operating at any data signalling rate up
CS-03 Issue 8 1996 through amendment 5	Specification for terminal equipment, terminal systems, Network protection devices, connection arrangements and hearing aids compatibility.	TBR 2 : 1997 Equipment (DTE) to (PSPDNs) for signalling rates up to 1 CCITT Recommendations	1 994 kbit/s Attachment requirements for Data Terminal connect to Packet Switched Public Data Networks CCITT Recommendation X.25 interfaces at data 920 kbit/s utilizing interfaces derived from X.21 and X.21 bit
TIA/EIA TSB31-B 1998	Bulletin Part 68 Rationale and Measurement Guidelines (Feb 1998)	(A2LA Cert. No. 1627-01) 10/31/03 Page 8 of 11	
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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	ACA TS 001 1997	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	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 (Including AM 2) UL 3111-1 1996 UL 3121-1 1995 IEC 60601-1 1995 EN 60601-1 1995 (Including AM 2) UL 2601-1 1997 IEC 60065 1998, 2000 ANSI/UL 6500: 1998 CAN/CSA 60065-00 AS/NZS 3250 1995 AS/NZS 60065 2000	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. 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 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		Electrical equipment for 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		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		Medical electrical equipment
TS 016 : 1997	General Requirements for Customer Equipment Connected to Hierarchical Digital Interfaces		Medical electrical equipment. Part 1: General Requirements for safety.
TS 031 : 1997	Requirements for ISDN Basic Access Interface		Audio, video and similar electronic apparatus – Safety requirements
TS 038 : 1997	Requirements for ISDN Primary Rate Access Interface		Audio/video and musical instrument apparatus for Household, commercial 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		Australian/New Zealand Standard – Approval and test Specification – Mains operated electronic and related Equipment for household and similar general use
Product Safety			Audio, video and similar electronic equipment. Consumer and 1994, commercial products
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>).			Safety requirements for main operated electronic and related apparatus for household and similar general use.
Product Safety Standards	Title		Radiation safety of laser products, equipment Classification, requirements and user's guide
Specific Product Safety Standards			Safety of laser products Part 1: equipment Classification, requirements and user's guide.
IEC 950 1991	Safety of information technology equipment including Includes Amendments 1, 2, 3, and 4 electrical business equipment.		Safety of laser products – Part 2: Safety of optical communication
UL 1950 1998	Safety of information technology equipment, including electrical business equipment.		
CSA C22.2 No.950-95	Safety of Information Technology Equipment (UL 1950)		
UL 60950 2000	Safety of information technology equipment		
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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		
Environmental²			
Environmental Standards	Title		
GR-63-CORE	NEBS Requirements: Physical Protection		
ETS 300 019	Environmental conditions and environmental tests For telecommunications equipment		
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² Environmental testing is performed at the satellite facility located at 168 Ayer Rd, Littleton, MA 01460