



Report No	ED0894-1
Client	Sensicast Systems, Inc. 220-3 Reservoir Street Needham, MA 02494
Phone	(781)-453-4555
Fax	(781)-453-0601
FRN	0009860149
EUT	H900 Mesh/Bridge Nodes & OAS/EMS Nodes
FCC ID	RNBF19D8MN9LQ2WFA
Equipment Type	Spread Spectrum Transmitter
Equipment Code	DSS
Results	As detailed within this report
Prepared by	 Evan Gould – Test Engineer
Authorized by	 Michael Buchholz – EMC Manager
Issue Date	12/1/03
Conditions of issue	This Test Report is issued subject to the conditions stated in ‘terms and conditions’ section of this report.

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

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Summary

This test report supports an application for certification of transmitters operating pursuant to 47 CFR 15.247. The products are the Sensicast H900 Mesh/Bridge Nodes and OAS/EMS Nodes. These products are frequency hoppers that utilize hopping tables of 53 channels in the range 902-928MHz. There are 16 models in this line of products: 7 “nodes” and 9 “coordinators”. The RF circuitry is the same in both. Both a node and a coordinator equipped with all available options were tested for this application.

Test Methodology

Radiated emissions testing is performed according to the procedures specified in ANSI C63.4 (2001). Public Notice DA 00-705 “*Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems*” was followed for testing as well.

Frequency range investigated: 0.15MHz – 10GHz

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

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

Emissions were maximized by rotating around three orthogonal axes. Fresh batteries were used.

Statement of Conformity

The H900 series of products have been found to conform with the following parts of the 47 CFR as detailed below:

Part 2	Part 15	Comments
	15.15(b)	There are no controls accessible to the user that adjust the power level of the device.
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 on page 4.
	15.27	No special accessories are required for compliance.
	15.203	The antenna used in this device is permanently attached.
	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.
	15.247	The unit complies with the frequency hopper requirements of 15.247

EUT Configuration

Node EUT Configuration				
Work Order: D0894				
Company: Sensicast Systems, Inc.				
Company Address: 220-3 Reservoir Street Needham, MA 02494				
Contact: John O'Brien				
Persons Present: Jared Fry, Mark Lucas				
MN		SN		
EUT: OAS100		K26394	antenna	
OAS100		K26405	connectorized	
EUT Description: "node"				
EUT Max Frequency: 927.3MHz				
Support Equipment:	MN	SN	FCC ID	
none				
EUT Cables:	Qty	Shielded?	Length	Ferrites
twisted pair	4	No	1m	No
Unpopulated EUT Ports:	Qty	Reason		
none				
Software / Operating Mode Description:				
transmitting packets; channel hopping; exercising all board functions				

Coordinator EUT Configuration

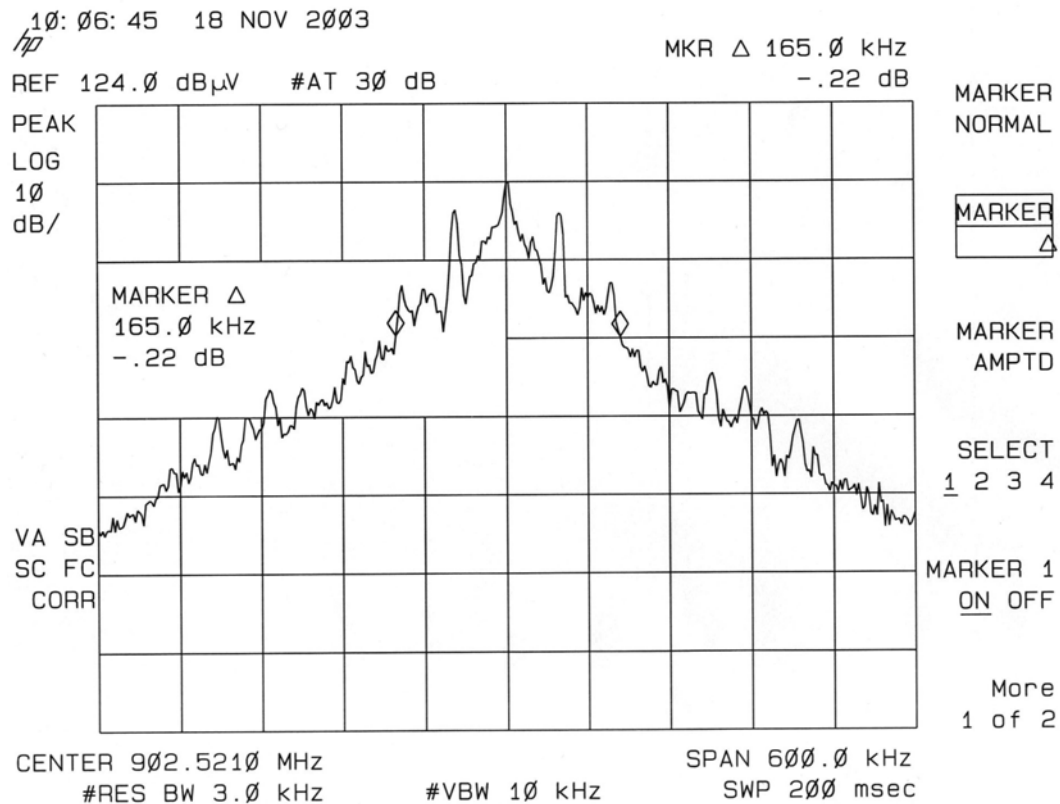
Work Order: D0894 Company: Sensicast Systems, Inc. Company Address: 220-3 Reservoir Street Needham, MA 02494 Contact: John O'Brien Persons Present: Jared Fry, Mark Lucas				
MN		SN		
EUT: MESH100 MESH100 EUT Description: "coordinator" EUT Max Frequency: 927.3MHz		K26447 antenna K26444 connectorized		
Support Equipment:		MN		
CUI Inc. AC adaptor -OR- Good Power Electronics Ltd AC adaptor		DV-6250 GPU280600250WD00		
EUT Cables:	Qty	Shielded?	Length	Ferrites
DB9 serial cable	1	No	1.5m	1 molded
DC Power	1	No	2m	No
twisted pair	3	No	1m	No
Unpopulated EUT Ports:		Qty	Reason	
none				
Software / Operating Mode Description:				
transmitting packets; channel hopping; exercising all board functions				

20dB Bandwidth - Node

MEASUREMENT

The 20dB bandwidth measured was **165kHz**. This value was used as the limit for the channel separation requirement.

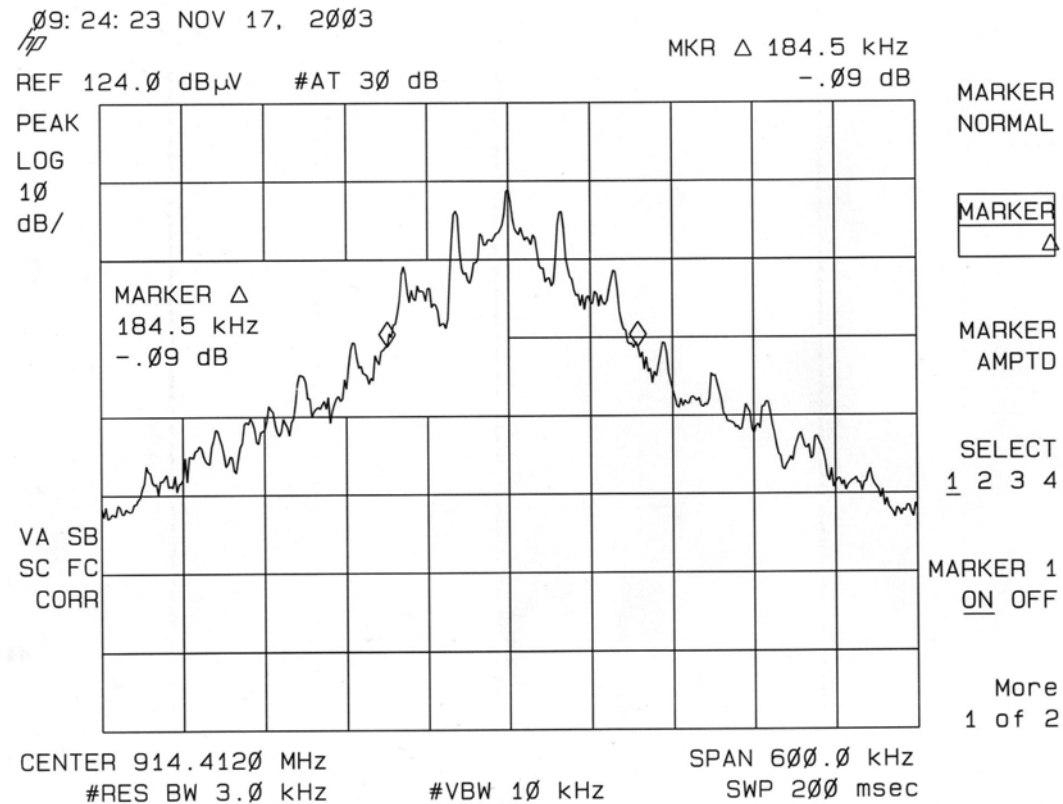
ANALYZER PLOT



20dB Bandwidth - Coordinator MEASUREMENT

The 20dB bandwidth measured was **184.5kHz**. This value was used as the limit for the channel separation requirement.

ANALYZER PLOT



Channel Separation - Node

REQUIREMENT

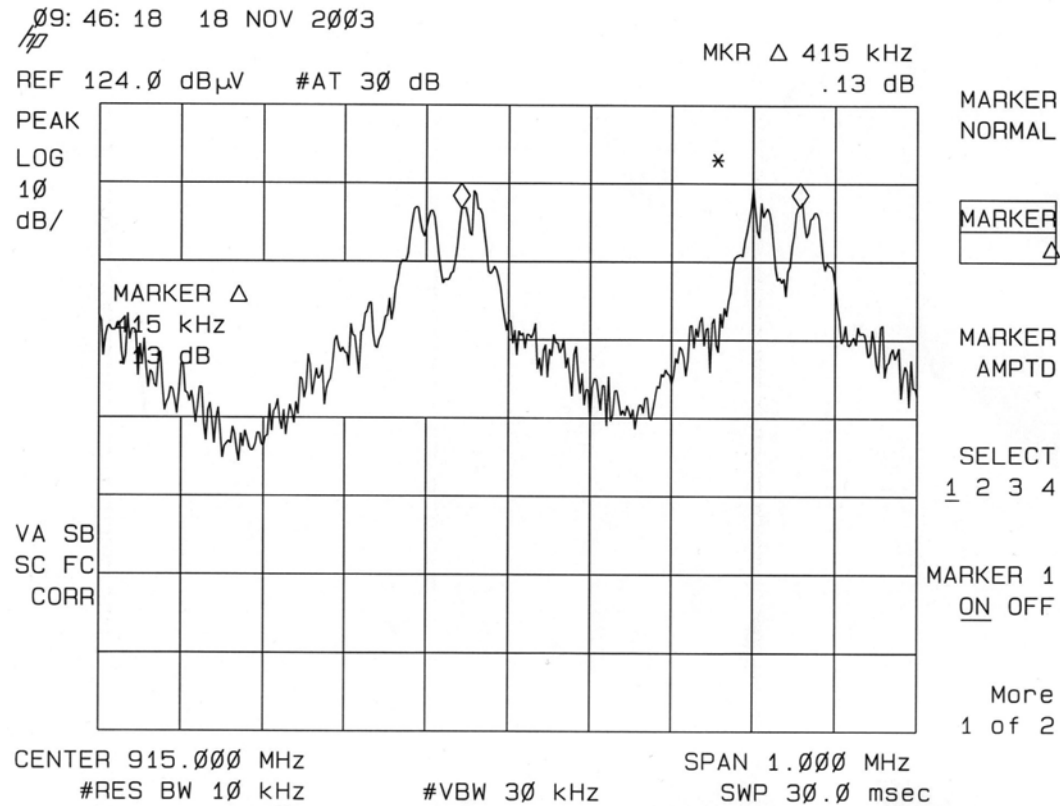
"Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater." [15.247(a)(1)]

20dB bandwidth = 165kHz (see "20dB Bandwidth" section)

MEASUREMENT

Channel separation = 415kHz

ANALYZER PLOT



Channel Separation - Coordinator

REQUIREMENT

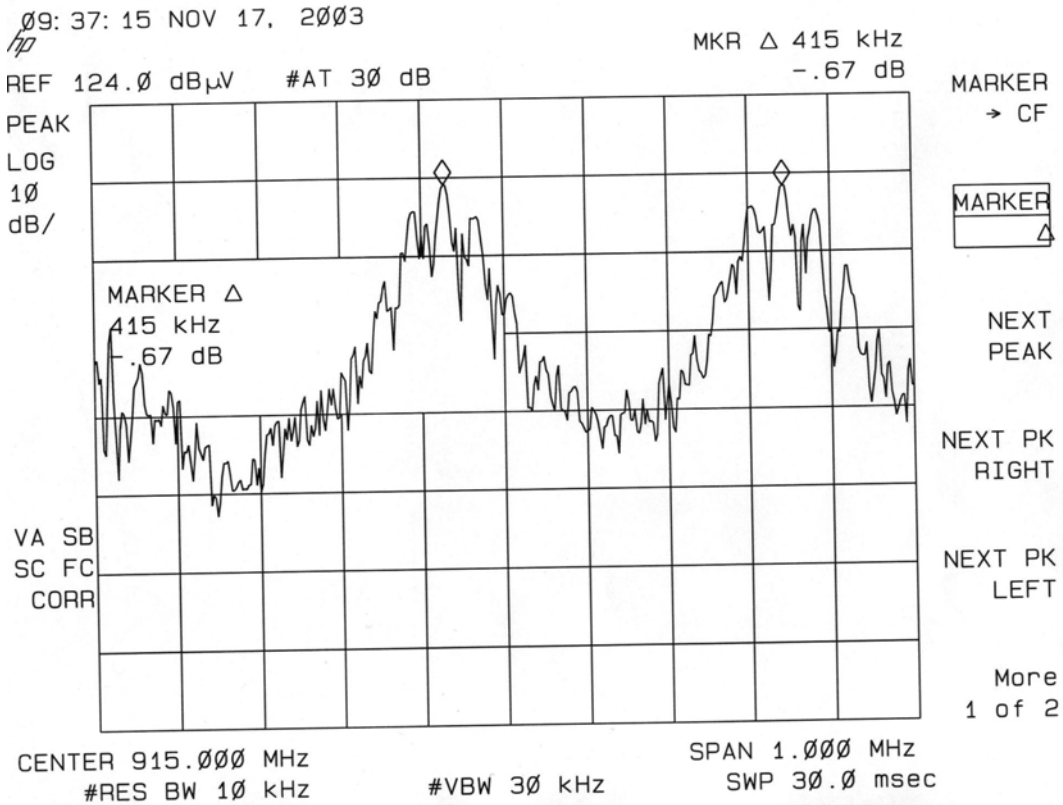
"Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater." [15.247(a)(1)]

20dB bandwidth = 184.5kHz (see "20dB Bandwidth" section)

MEASUREMENT

Channel separation = 415kHz

ANALYZER PLOT



Number of Hopping Frequencies - Node

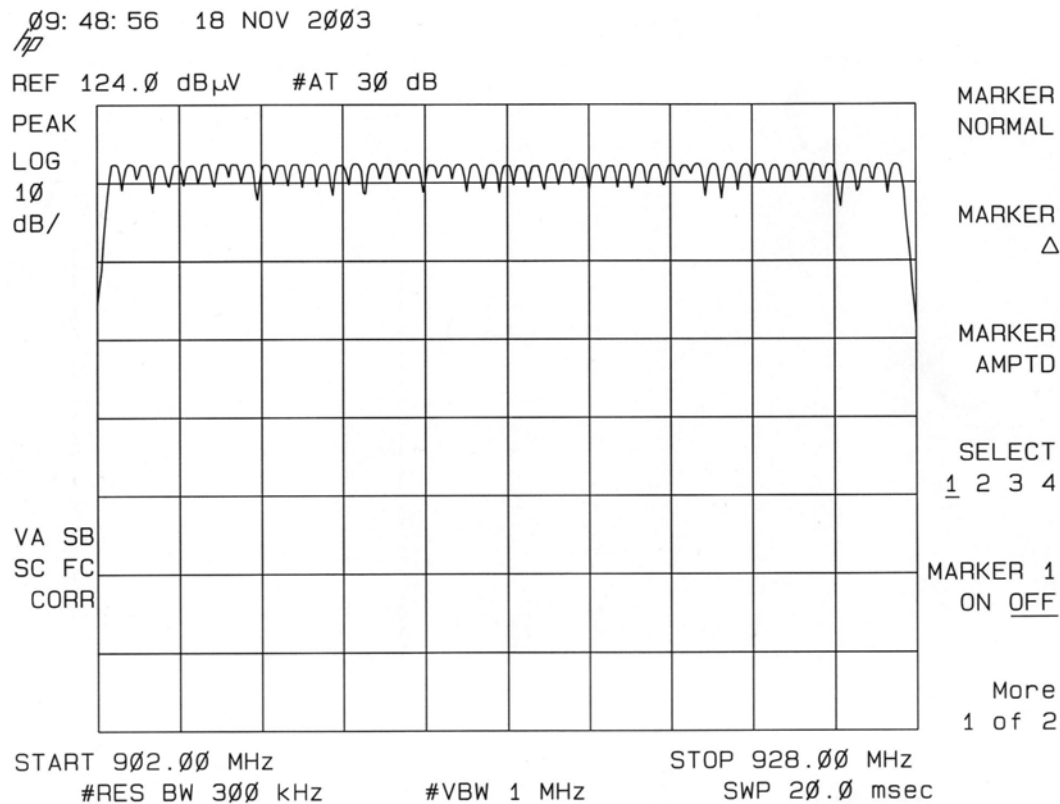
REQUIREMENT

"For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250kHz, the system shall use at least 50 hopping frequencies..." [15.247(a)(1)(i)]

MEASUREMENT

Number of hopping frequencies = 53

ANALYZER PLOT



Number of Hopping Frequencies - Coordinator

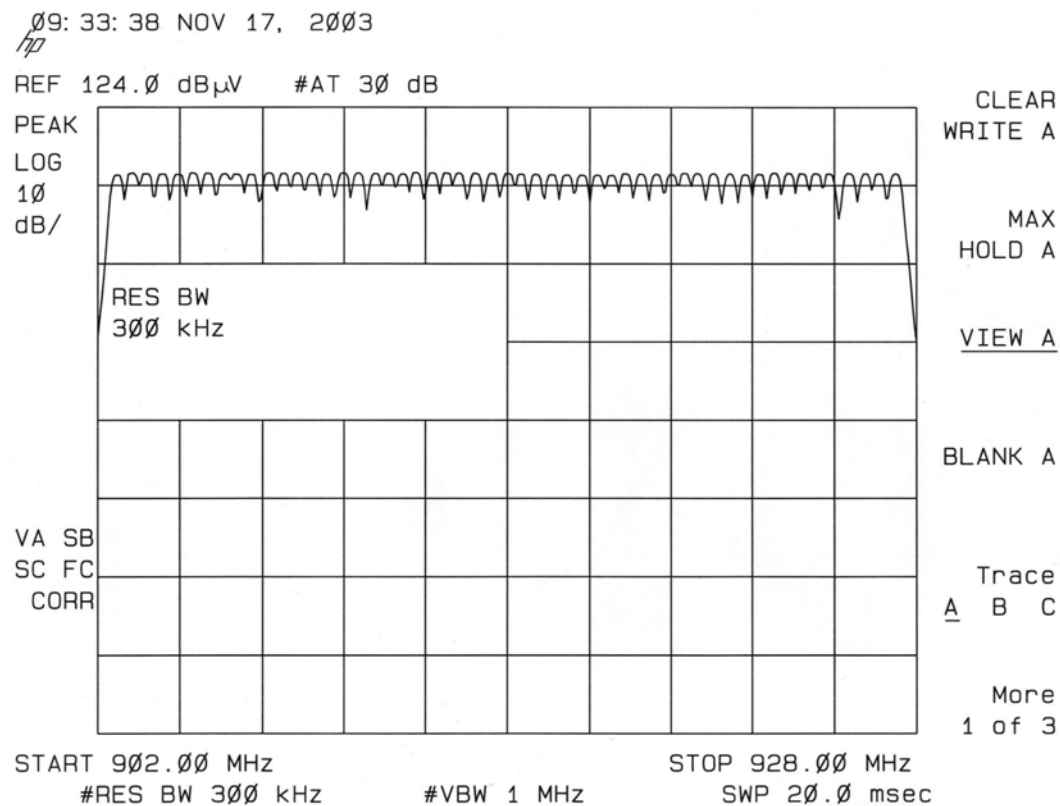
REQUIREMENT

"For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250kHz, the system shall use at least 50 hopping frequencies..." [15.247(a)(1)(i)]

MEASUREMENT

Number of hopping frequencies = 53

ANALYZER PLOT



Time of Occupancy (Dwell Time) - Node

REQUIREMENT

"...the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period;" [14.247(a)(1)(i)]

MEASUREMENTS

Plots of the dwell time were taken for three different data rates: 19.2, 38.4, and 76.8kbaud. Every 400ms, the EUT hops to the next channel in the pseudorandom hopping table. Since the hopping table is comprised of 53 different channels, the EUT will not return to the same channel twice in any 20s interval. The measured dwell times are as follows:

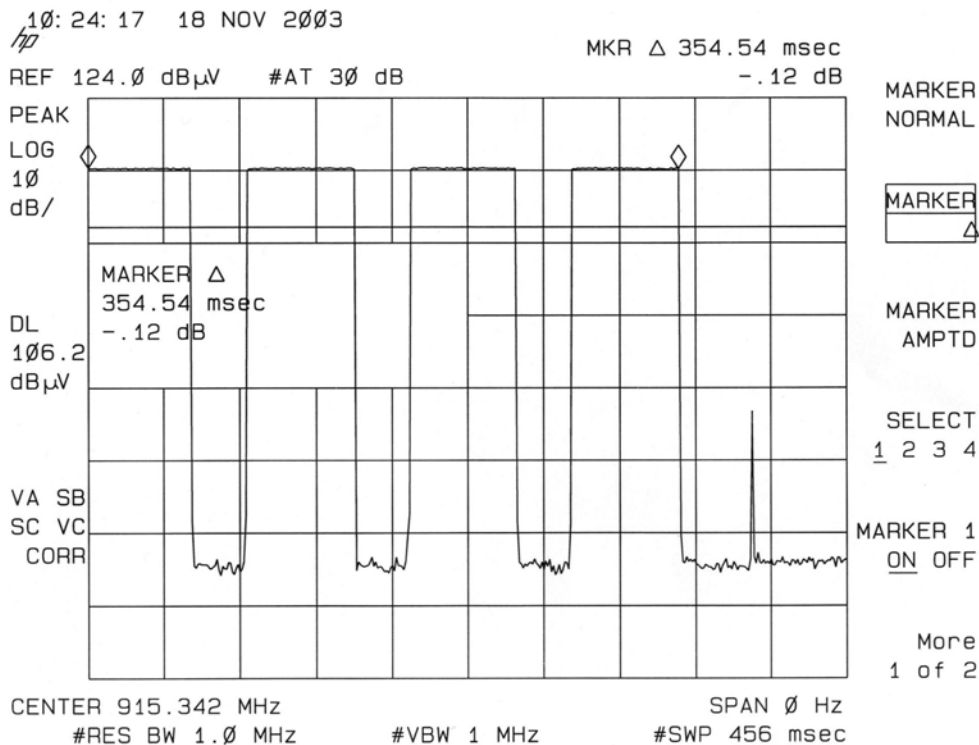
19.2kbaud – 354.5ms

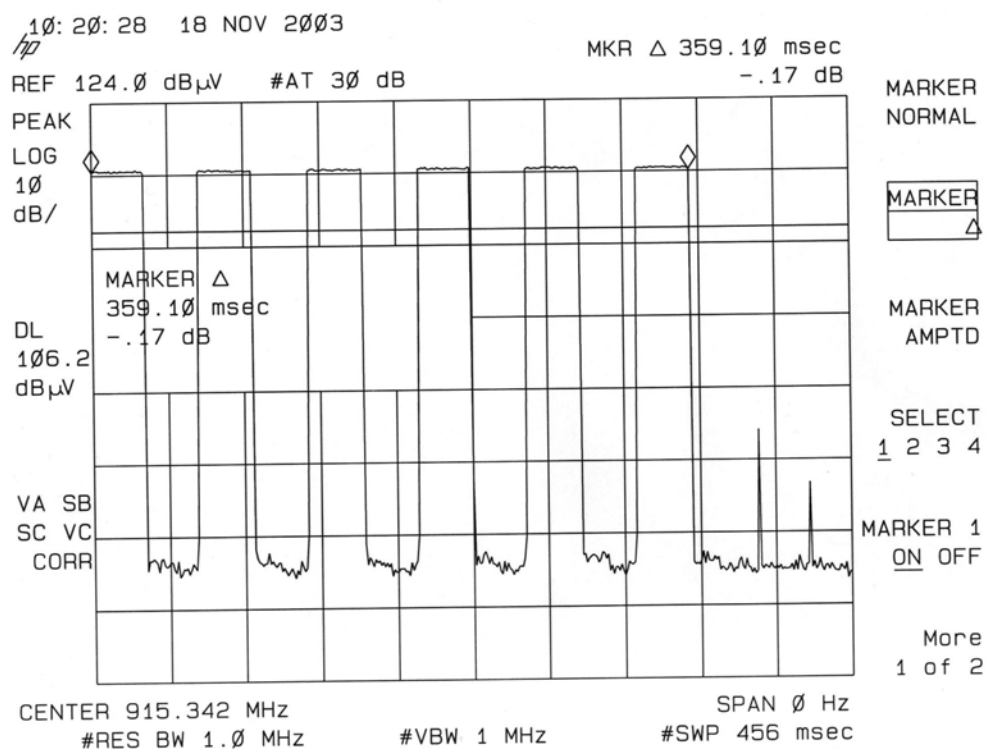
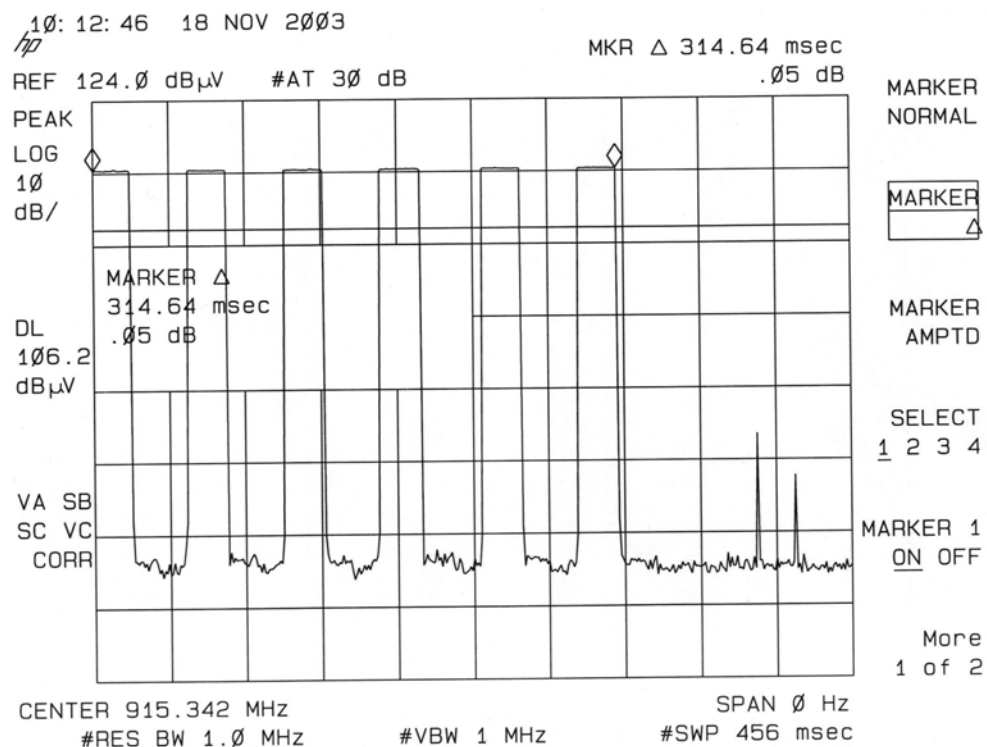
38.4kbaud – 359.1ms

76.8kbaud – 314.6ms

ANALYZER PLOTS

Dwell Time - 19.2kbaud



Dwell Time - 38.4kbaud**Dwell Time - 76.8kbaud**

Time of Occupancy (Dwell Time) - Coordinator

REQUIREMENT

"...the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period;" [14.247(a)(1)(i)]

MEASUREMENTS

Plots of the dwell time were taken for three different data rates: 19.2, 38.4, and 76.8kbaud. Every 400ms, the EUT hops to the next channel on the predetermined hopping table. Since the hopping table is comprised of 53 different channels, the EUT will not return to the same channel twice in any 20s interval. The measured dwell times are as follows:

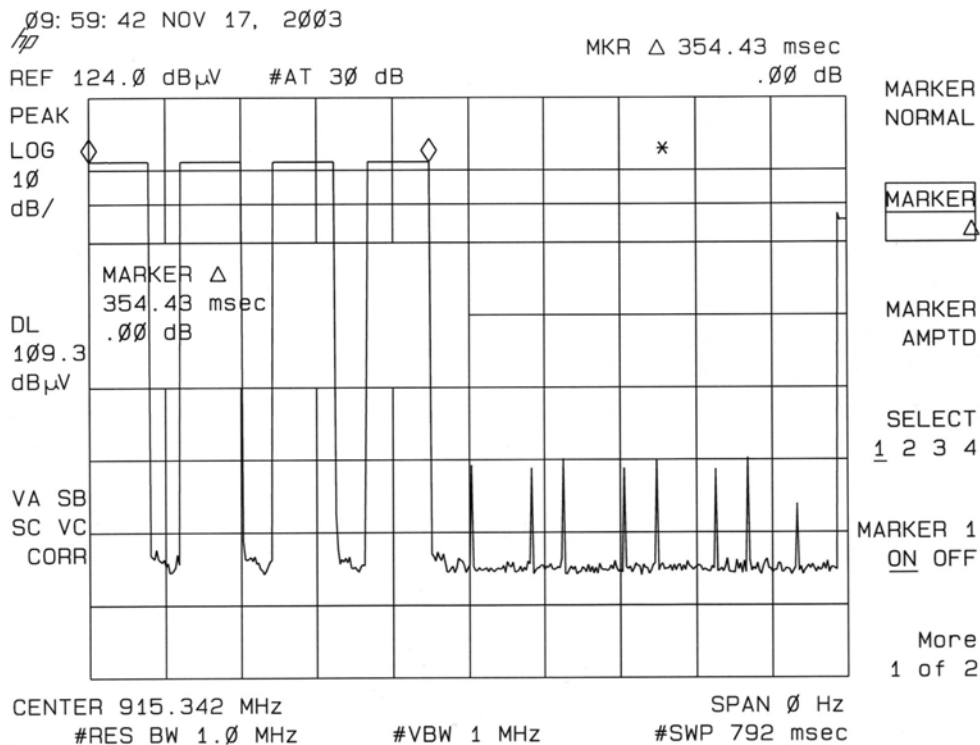
19.2kbaud – 354.4ms

38.4kbaud – 357.7ms

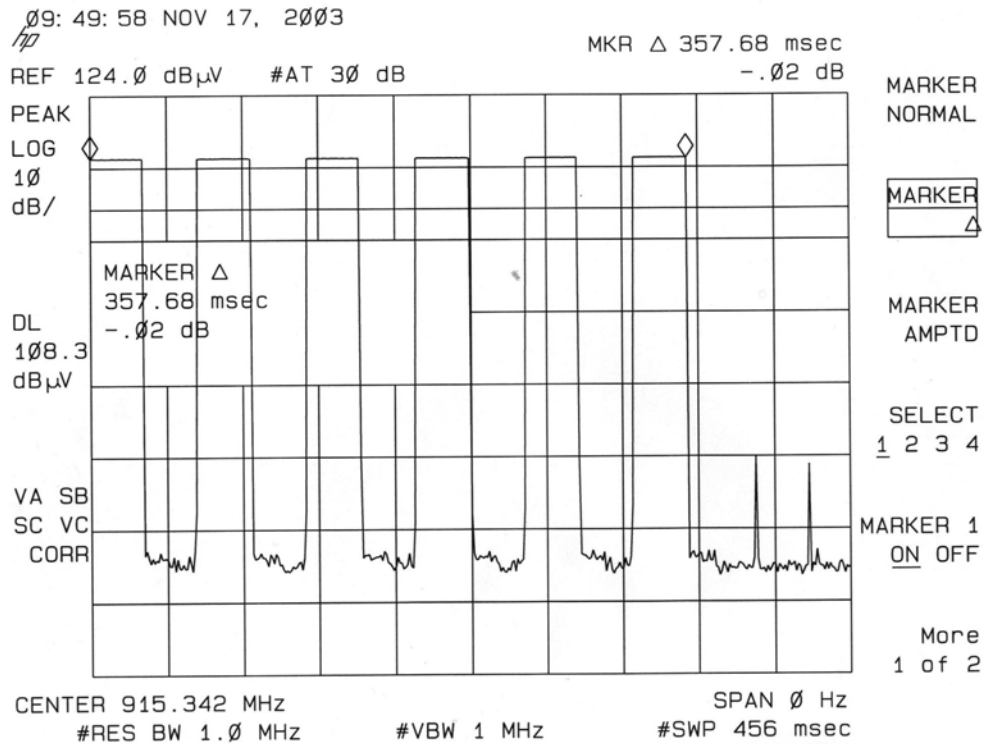
76.8kbaud – 313.3ms

ANALYZER PLOTS

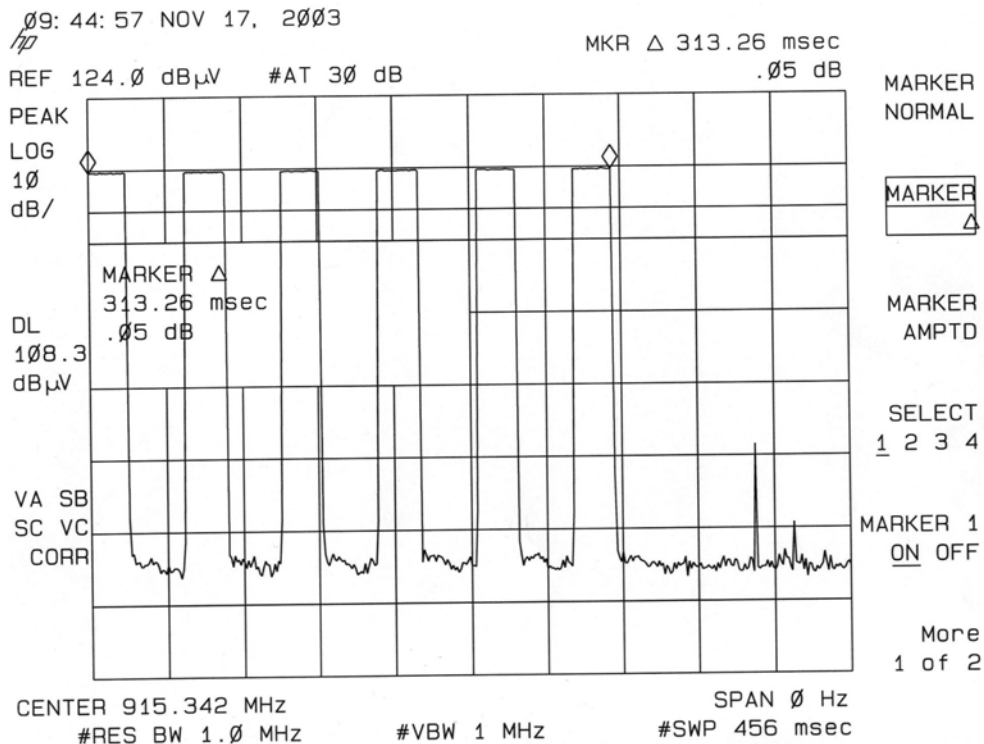
Dwell Time - 19.2kbaud



Dwell Time - 38.4kbaud



Dwell Time - 76.8kbaud



Peak Output Power - Node

LIMIT

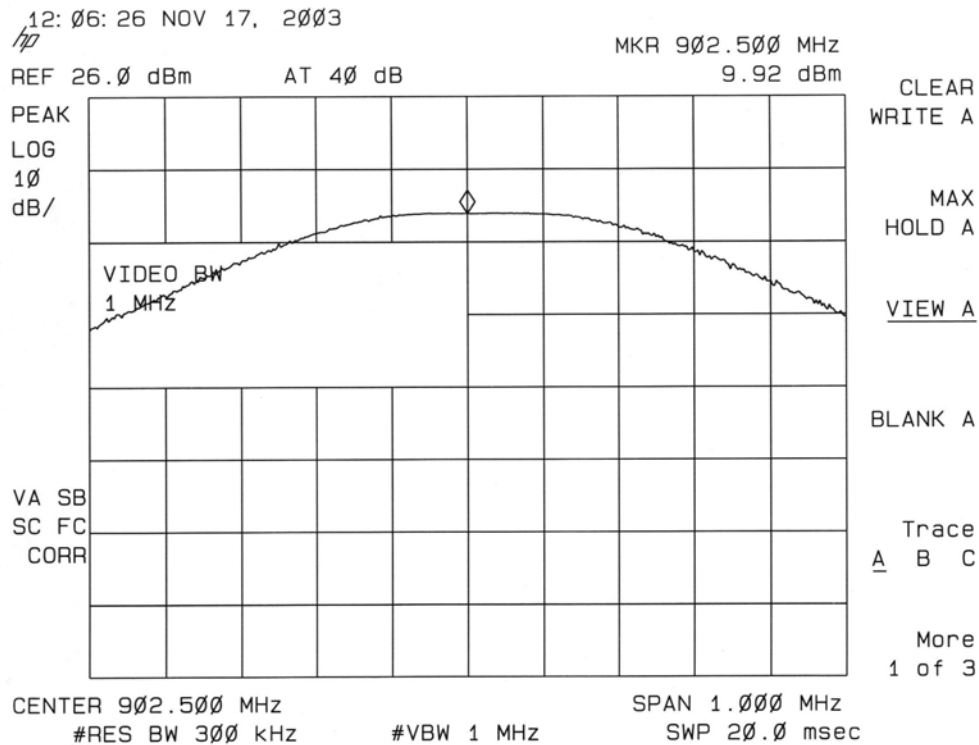
"The maximum peak output power of...systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels." [15.247(b)(2)]

MEASUREMENTS

Peak Output Power						CurtisStraus LLC		
Date: 17-Nov-03		Engineer: Evan Gould			Work Order: D0894			
Company: Sensicast		EUT: node			Fundamental Frequencies: 902.5-927.3MHz			
Test Site: "T"					Cable: N/A*			
Attenuator: N/A					Analyzer: Green			
Measurement: Conducted					Resolution BW: 300kHz			
Detector Type: Peak					Video BW: 1MHz			
Notes: *EUT was connected directly to the analyzer								
Channel Number	Frequency (MHz)	Reading (dBm)	Attenuator Factor (dB)	Cable Factor (dB)	Adjusted Reading (dBm)	47 CFR 15.247(b)(2)		
						Limit (dBm)	Margin (dB)	Result (Pass/Fail)
0	902.5	9.9	0.0	0.0	9.9	30.0	-20.1	Pass
26	914.9	9.7	0.0	0.0	9.7	30.0	-20.3	Pass
52	927.2	9.8	0.0	0.0	9.8	30.0	-20.2	Pass

SAMPLE ANALYZER PLOT

Channel 0

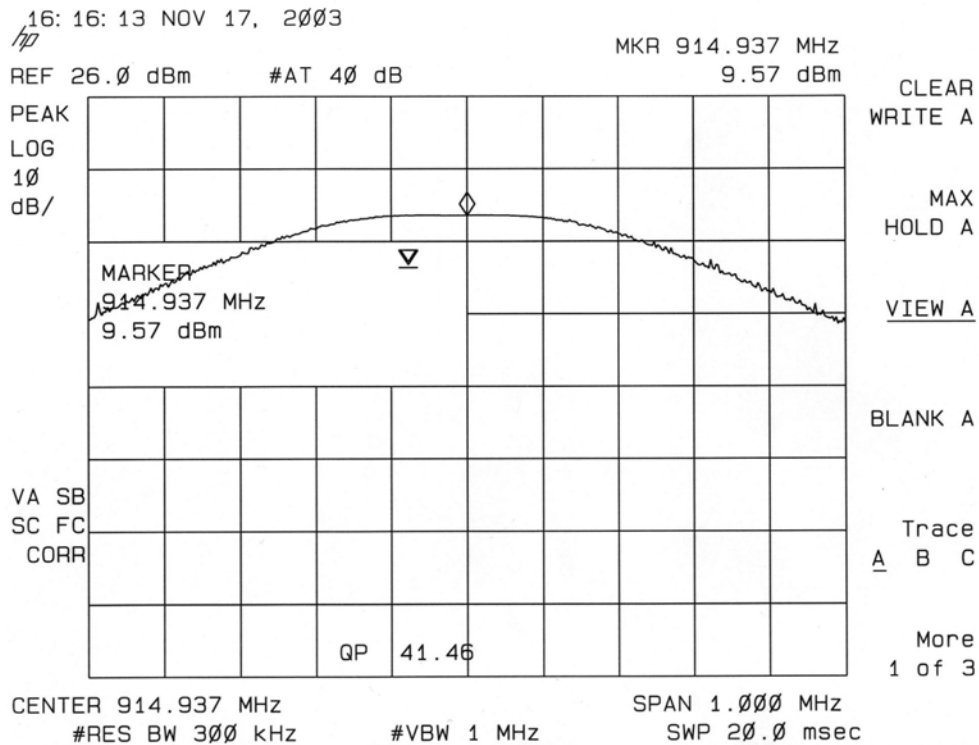


Peak Output Power – Coordinator**LIMIT**

"The maximum peak output power of...systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels." [15.247(b)(2)]

MEASUREMENTS

Peak Output Power						CurtisStraus LLC		
Date: 17-Nov-03		Engineer: Evan Gould			Work Order: D0894			
Company: Sensicast		EUT: coordinator			Fundamental Frequencies: 902.5-927.3MHz			
Test Site: "T"					Cable: N/A*			
Attenuator: N/A					Analyzer: Green			
Measurement: Conducted					Resolution BW: 300kHz			
Detector Type: Peak					Video BW: 1MHz			
Notes: *EUT was connected directly to the analyzer								
Channel Number	Frequency (MHz)	Reading (dBm)	Attenuator Factor (dB)	Cable Factor (dB)	Adjusted Reading (dBm)	47 CFR 15.247(b)(2)		
						Limit (dBm)	Margin (dB)	Result (Pass/Fail)
0	902.5	9.4	0.0	0.0	9.4	30.0	-20.6	Pass
26	914.9	9.6	0.0	0.0	9.6	30.0	-20.4	Pass
52	927.2	9.4	0.0	0.0	9.4	30.0	-20.6	Pass

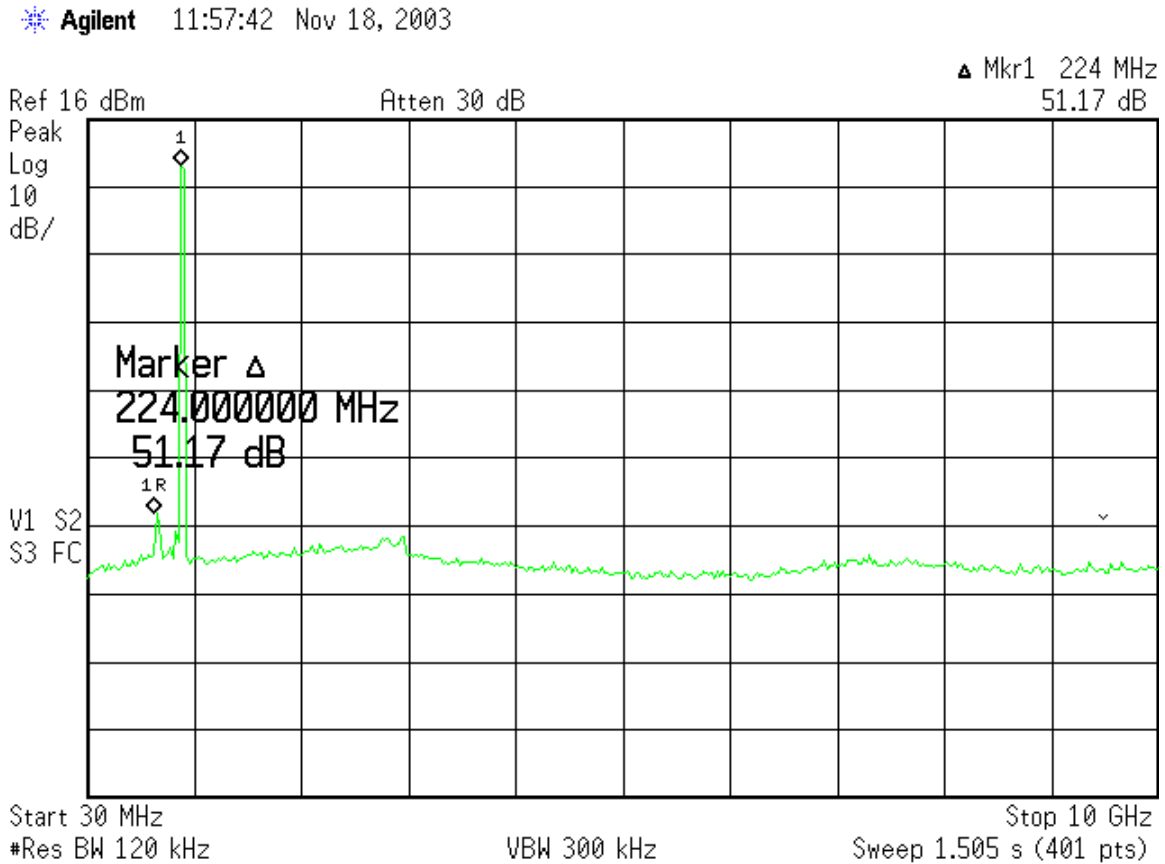
SAMPLE ANALYZER PLOT**Channel 26**

Conducted Spurious Emissions - Node**LIMIT**

Peak: 20dB down from fundamental [15.247(c)]

MEASUREMENTS

No conducted spurious emissions within 20dB of the fundamental were detected.
See plot below.

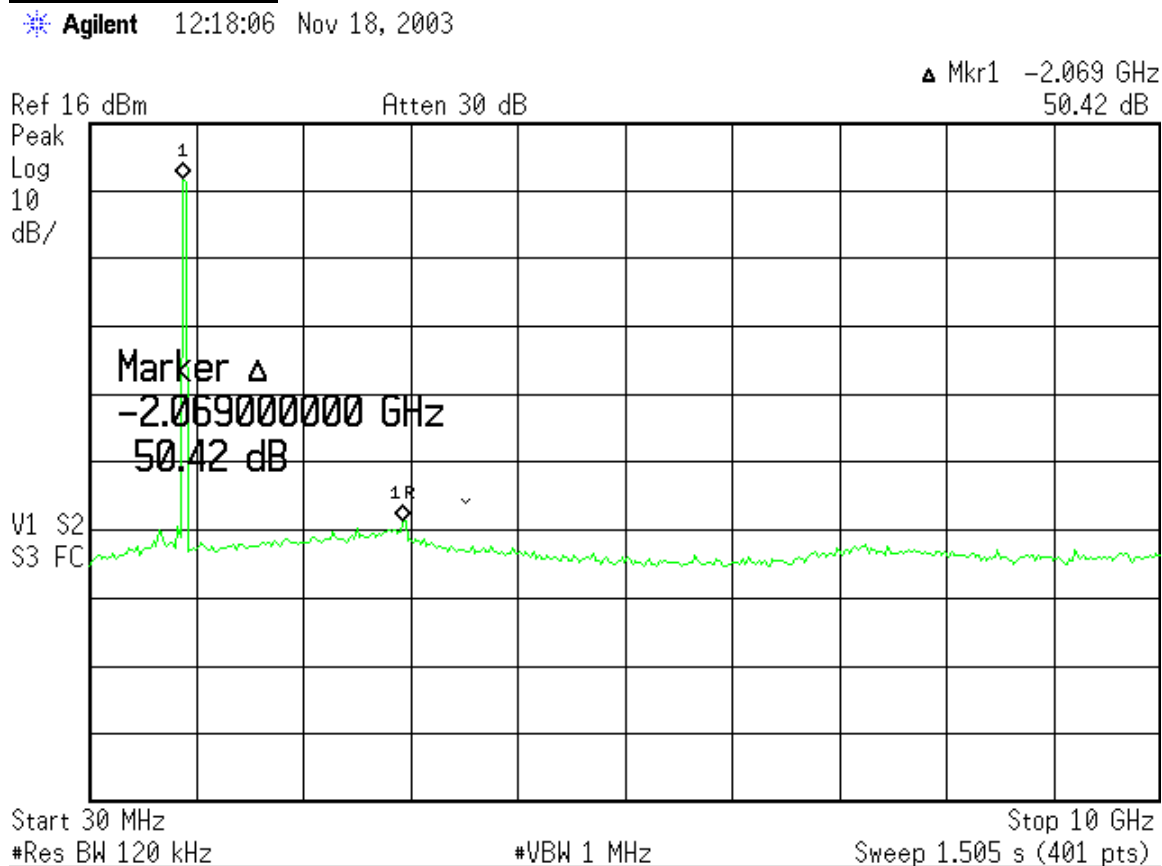
ANALYZER PLOT

Conducted Spurious Emissions - Coordinator**LIMIT**

Peak: 20dB down from fundamental [15.247(c)]

MEASUREMENTS

No conducted spurious emissions within 20dB of the fundamental were detected.
See plot below.

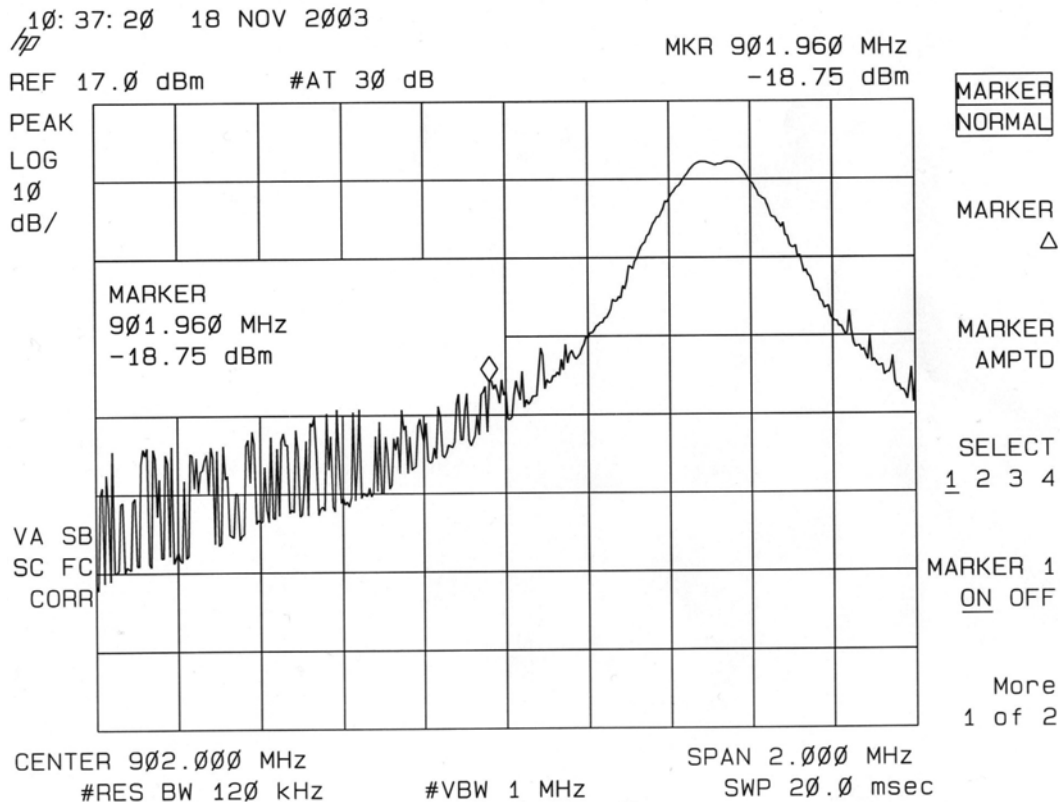
ANALYZER PLOT

Conducted Band Edges - Node**LIMITS**

Peak: 20dB down from fundamental [15.247(c)]

RESULTS

It can easily be seen in the plots shown below that the conducted band edges are at least 20dB down from the peak of the fundamental.

ANALYZER PLOTS**Channel 0 - Low Band Edge**

Channel 52 – High Band Edge

10: 39: 59 18 NOV 2003

170

MKR 928.040 MHz

REF 17.0 dBm

#AT 30 dB

-23.04 dBm

PEAK

LOG

10

dB/

CLEAR

WRITE A

MAX

HOLD A

VIEW A

BLANK A

Trace

A B C

More

1 of 3

MARKER
928.040 MHz
-23.04 dBm

VA SB
SC FC
CORR

CENTER 928.000 MHz

#RES BW 120 kHz

#VBW 1 MHz

SPAN 2.000 MHz

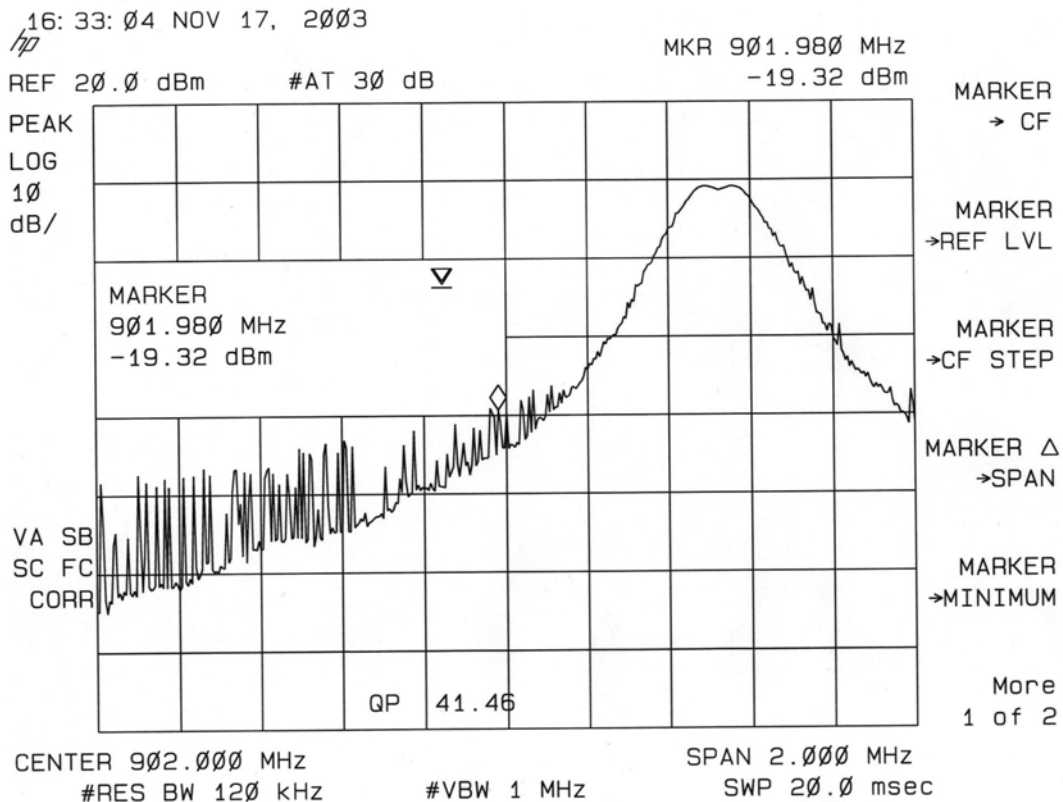
SWP 20.0 msec

Conducted Band Edges - Coordinator**LIMITS**

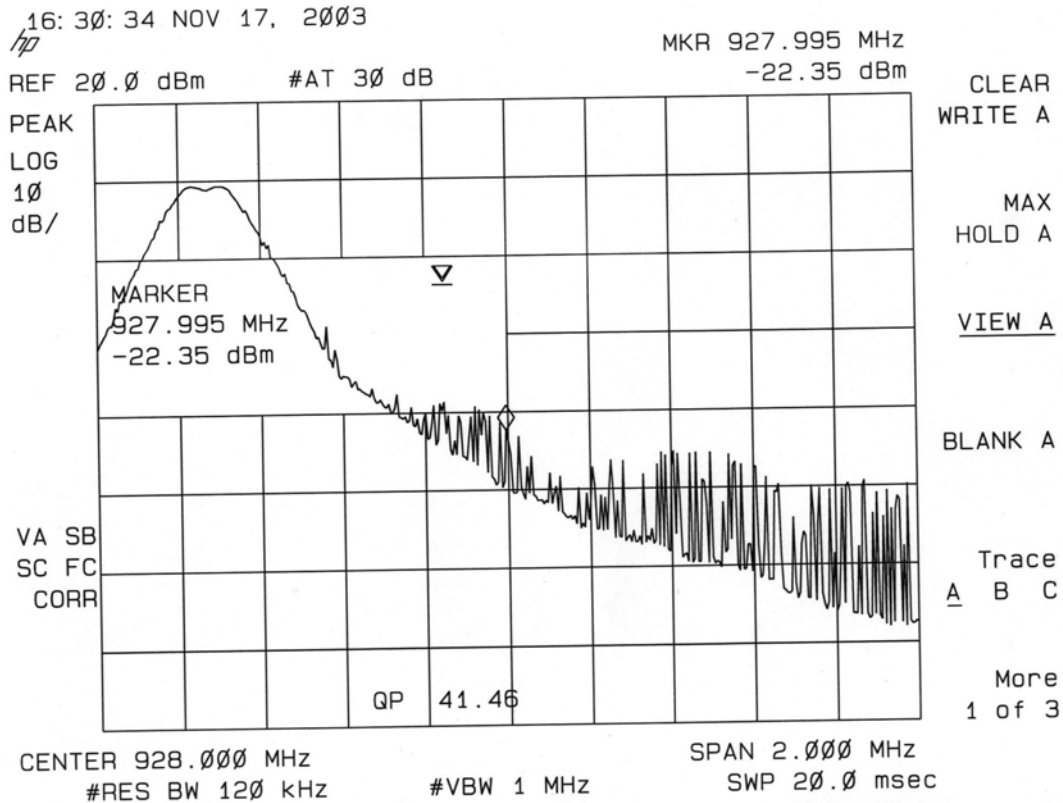
Peak: 20dB down from fundamental [15.247(c)]

RESULTS

It can easily be seen in the plots shown below that the conducted band edges are at least 20dB down from the peak of the fundamental.

ANALYZER PLOTS**Channel 0 - Low Band Edge**

Channel 52 – High Band Edge



Antenna Gains

REQUIREMENT

This purpose of this section is to demonstrate that the actual directional gain of the antenna is no larger than 6dBi.

MEASUREMENTS

EIRP/Directional Gain							CurtisStraus LLC		
Date: 19-Nov-03			Company: Sensicast				Work Order: D0894		
Engineer: Evan Gould			EUT Desc: H900 series						
Frequency Range: 902-928MHz						Measurement Distance: 3.75 m			
Notes:						EUT Max Freq: 927.2MHz			
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBμV/m)	EIRP (dBm)	Conducted Output Power (dBm)	Directional Gain (dBi)
Coordinator									
Hpk	902.5	96.7	19.8	24.3	4.9	106.1	12.8	9.4	3.4
Hpk	914.9	96.7	19.7	24.2	5.0	106.2	12.9	9.6	3.3
Hpk	927.2	96.3	19.7	24.2	5.0	105.8	12.5	9.4	3.1
Node									
Vpk	902.5	96.4	19.8	24.3	4.9	105.8	12.5	9.9	2.6
Vpk	915.0	95.1	19.7	24.2	5.0	104.6	11.3	9.7	1.6
Vpk	927.3	93.6	19.7	24.2	5.0	103.1	9.8	9.8	0.0
Test Site: "T"		Pre-Amp: Green		Cable: 65 ft RG8A/U		Analyzer: Green		Antenna: Blue	

Radiated Spurious Emissions

LIMITS

“...radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)”
[15.247(c)]

MEASUREMENTS

No spurious emissions were detected within 20dB of the limit in the restricted bands. Both the node and coordinator were scanned in the range 30MHz – 10GHz.

AC Line Conducted Emission Measurements**LIMITS**

Frequency of emission (MHz)	Quasi-peak limit (dBμV)	Average limit (dBμV)
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										CurtisStraus LLC
Date: 18-Nov-03		Company: Sensicast				Work Order: D0894				
Engineer: Evan Gould		EUT Desc: coordinator				Test Site: EMI 1				
Notes: CUI supply										
LISN(s): Red										
Range: 0.15-30Mhz		Other Equipment:				Spectrum Analyzer: Blue				
Frequency (MHz)	Q.P. Readings		Ave. Readings		Impedance Factor (dB)	47 CFR 15.207		47 CFR 15.207		Overall Result (Pass/Fail)
	QP1 (dBμV)	QP2 (dBμV)	AV1 (dBμV)	AV2 (dBμV)		qp Limit (dBμV)	qp Margin dB	AVE Limit (dBμV)	AVE Margin dB	
0.45	13.0	15.6			20.0	56.9	-21.3	46.9	-11.3	Pass
4.85	5.7	5.6			20.0	56.0	-30.3	46.0	-20.3	Pass
10.90	6.0	5.8			20.0	60.0	-34.0	50.0	-24.0	Pass
16.10	5.9	6.0			20.0	60.0	-34.0	50.0	-24.0	Pass
20.50	6.3	6.3			20.0	60.0	-33.7	50.0	-23.7	Pass
25.20	6.1	6.7			20.0	60.0	-33.3	50.0	-23.3	Pass
Table Result: Pass by -11.30 dB Worst Freq: 0.45 MHz										

AC Mains Conducted Emissions										CurtisStraus LLC
Date: 18-Nov-03		Company: Sensicast				Work Order: D0894				
Engineer: Evan Gould		EUT Desc: coordinator				Test Site: EMI 1				
Notes: Good Power Electronics Ltd. supply										
LISN(s): Red										
Range: 0.15-30Mhz		Other Equipment:				Spectrum Analyzer: Blue				
Frequency (MHz)	Q.P. Readings		Ave. Readings		Impedance Factor (dB)	47 CFR 15.207		47 CFR 15.207		Overall Result (Pass/Fail)
	QP1 (dBμV)	QP2 (dBμV)	AV1 (dBμV)	AV2 (dBμV)		qp Limit (dBμV)	qp Margin dB	AVE Limit (dBμV)	AVE Margin dB	
0.45	7.8	8.1			20.0	56.9	-28.8	46.9	-18.8	Pass
4.85	4.7	5.1			20.0	56.0	-30.9	46.0	-20.9	Pass
10.90	4.4	5.2			20.0	60.0	-34.8	50.0	-24.8	Pass
16.10	4.9	3.6			20.0	60.0	-35.1	50.0	-25.1	Pass
20.50	4.5	5.9			20.0	60.0	-34.1	50.0	-24.1	Pass
25.20	4.9	7.6			20.0	60.0	-32.4	50.0	-22.4	Pass
Table Result: Pass by -18.80 dB Worst Freq: 0.45 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

Voltage Variations						CurtisStraus LLC		
Date: 18-Nov-03		Engineer: Evan Gould			Work Order: D0894			
Company: Sensicast		EUT: coordinator			Fundamental Frequency: 902.5MHz			
Test Site: "T"				Cable: N/A				
Attenuator: N/A				Analyzer: Orange				
Measurement: Conducted			Resolution BW: 120kHz					
Detector Type: Peak			Video BW: 1MHz					
Notes: CUI power supply								
Supply Voltage	Frequency (MHz)	Reading (dBm)	Factor (dB)	Factor (dB)	Adjusted Reading (dBm)			
102V	902.5	6.6	0.0	0.0	6.6			
120V (nominal)	902.5	6.6	0.0	0.0	6.6			
138V	902.5	6.6	0.0	0.0	6.6			

Voltage Variations

CurtisStraus LLC

Date: 18-Nov-03

Company: Sensicast

Engineer: Evan Gould

EUT: coordinator

Work Order: D0894

Fundamental Frequency: 902.5MHz

Test Site: "T"

Attenuator: N/A

Measurement: Conducted

Detector Type: Peak

Cable: N/A

Analyzer: Orange

Resolution BW: 120kHz

Video BW: 1MHz

Notes: Good Power Electronics supply

Supply Voltage	Frequency (MHz)	Reading (dBm)	Factor (dB)	Factor (dB)	Adjusted Reading (dBm)			
102V	902.5	6.6	0.0	0.0	6.6			
120V (nominal)	902.5	6.6	0.0	0.0	6.6			
138V	902.5	6.6	0.0	0.0	6.6			

Test Equipment Used

REV. 11/17/03

SPECTRUM ANALYZERS	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
BLUE	9kHz-1.8GHz	8591E	HP	3223A00227	00070	30-SEP-2004
YELLOW	9kHz-2.9GHz	8594E	HP	3523A01958	00100	08-JUL-2004
GREEN	9kHz-26.5GHz	8593E	HP	3829A03618	00143	10-OCT-2004
ORANGE	9kHz-26.5GHz	E4407B	HP	US39440975	00394	27-JUN-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
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
BLUE BILOG	30MHz-1GHz	3143	EMCO	1271	00803	17-MAR-2005
YELLOW HORN	1-18GHz	3115	EMCO	9608-4898	00037	22-MAY-2005
PREAMPS	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

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

Terms And Conditions

Paragraph 1. SERVICES. LABORATORY will:

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

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

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

Paragraph 3. GENERAL CONDITIONS:

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

Paragraph 4. INSURANCE:

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

Paragraph 5. PAYMENT:

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

Paragraph 6. ISO/IEC GUIDE 17025 ADDITIONS:

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

A2LA Accreditation

<p align="center"><u>SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999</u></p> <p align="center">CURTIS-STRAUS¹ 527 Great Road Littleton, MA 01460 Barry Quinlan Phone: 978-486-8880</p> <p align="center">ELECTRICAL</p> <p>Valid until: July 31, 2005 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 tests:</u></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> <p><u>EMC Standards</u></p> <p><i>Emissions</i> CISPR 22 1997 with amendments 1 and 2 CNS13438 1994 EN55022:1994 and 1998 SABS CISPR 22:1997 Canada ICES-003 1997 AS/NZS 3548 1995 CISPR 11 1990, 1997, 1999</p> <p><u>Immunity</u> CISPR 14-2 1996, 1997 + A1:2001 CISPR 20: 1995, 2002 with amendment 3 television broadcast receivers and associated EN 55020: 1995, 2002 (associated group only) CISPR 24 SABS CISPR 24 1997 AS/NZS 3200.1.2: 1995 <i>European Union Basic EMC Standards</i> EN 61000-4-2: 1995, 1999, 2001 EN 61000-4-3:1997, 1998, 2002 AS/NZS 61000.4.3 1999 EN 61000-4-4 1995 EN 61000-4-5 1995 AS/NZS 61000.4.5 1999 EN 61000-4-6 1996 AS/NZS 61000.4.6 1999 EN 61000-4-8 1994 EN 61000-4-11 1994 ENV 61000-2-2 1993 <i>EU Product Family Standards</i> EN 50081-1 1992 EN 50081-2 1993 EN 50082-1 1992, 1998 EN 50082-2 1995</p> <p>(A2LA Cert. No. 1627-01) 10/31/03</p>	
<p>EN 55011 1991, 1998 SABS CISPR 11:1997 Canada ICES-001 1998 CNS13803 AS/NZS 2064: 1997 CSA C108.8 – M1983 CISPR 13:1996, 1998, 2001 EN 55013: 1990, 2001 EN 55013 Amend 12 1994 SABS CISPR 13: 1996 CNS 13439 AS/NZS 1053: 1999 CISPR 14 1993 EN 55014 1993, 1997 AS/NZS 1044: 1995 <i>Immunity</i> CNS13783-1 SABS CISPR 14-1 1993 SABS CISPR 14-2 1997 + A1:2001</p>	<p>Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment. Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics Limits and methods of measurement Industrial, scientific and medical radio frequency generators Industrial, Scientific and Medical Instrument Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment. Electromagnetic Emission from Data Processing Equipment and Electronic Office Machines Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment. 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. Limits and methods of measurement of radio disturbance characteristics of broadcast receivers and associated equipment. Amendment 12 Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment. Broadcast receiver and associated equipment Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment. Limits and methods of measurement of radio disturbance (except discontinuous disturbances) characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and electric apparatus. Limits and methods of measurement of radio disturbance (except discontinuous disturbances) characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus. Limits and methods of measurement of radio disturbance (except discontinuous disturbances) characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus. Household Electrical Appliances Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus Part 1: Emission – Product family standard Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus Part 2: Immunity - Product family standard</p>
<p>(A2LA Cert. No. 1627-01) 10/31/03</p>	<p>(A2LA Cert. No. 1627-01) 10/31/03</p>
<p>CISPR 14-2 1996, 1997 + A1:2001 CISPR 20: 1995, 2002 with amendment 3 television broadcast receivers and associated EN 55020: 1995, 2002 (associated group only) CISPR 24 SABS CISPR 24 1997 AS/NZS 3200.1.2: 1995 <i>European Union Basic EMC Standards</i> EN 61000-4-2: 1995, 1999, 2001 EN 61000-4-3:1997, 1998, 2002 AS/NZS 61000.4.3 1999 EN 61000-4-4 1995 EN 61000-4-5 1995 AS/NZS 61000.4.5 1999 EN 61000-4-6 1996 AS/NZS 61000.4.6 1999 EN 61000-4-8 1994 EN 61000-4-11 1994 ENV 61000-2-2 1993 <i>EU Product Family Standards</i> EN 50081-1 1992 EN 50081-2 1993 EN 50082-1 1992, 1998 EN 50082-2 1995</p>	<p>Immunity requirements for household appliances, tools and similar apparatus. Limits and methods of measurement of immunity characteristics (associated group only) of sound and equipment. Electromagnetic immunity of broadcast receivers and associated equipment. Information technology equipment – Immunity characteristics – Limits and methods of measurement Information technology equipment – Immunity characteristics – Limits and methods of measurement Approval and test specification – Medical electrical Equipment – General requirements for safety – Collateral Standard: Electromagnetic compatibility – Requirements and tests. Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 2: Electrostatic discharge immunity test – Basic EMC Publication Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 3: Radiated, radio-frequency, electromagnetic field immunity test Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 4: Electrical fast transient/burst immunity test – Basic EMC publication (EMC) Part 4: Testing and measurement techniques. Section 5: Surge immunity test. Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 6: Immunity to conducted disturbances, induced by radio-frequency fields. Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 8: Power frequency magnetic field immunity test. (EMC) Part 4: Testing and measurement techniques. Section 11: Voltage dips, short interruptions and voltage Variations immunity tests. Electromagnetic compatibility (EMC). Part 2: Environment, Section 2: Compatibility levels for low-frequency conducted disturbances and signaling in public low-voltage power supply systems (IEC 1000-2-2:1990) Electromagnetic capability – Generic emission standard. Part 1: Residential, commercial and light industry. (I.S.) Electromagnetic compatibility – Generic emission standard. Part 2: Industrial environment Electromagnetic compatibility – Generic emission standard. Part 1: Residential, commercial and light industry Electromagnetic compatibility – Generic immunity Standard. Part 2: Industrial environment</p>
<p>(A2LA Cert. No. 1627-01) 10/31/03</p>	<p>EN 61000-6-1: 1997, 2001 EN 61000-6-2: 1998, 2001 EN 50091-2 1996 EN 55024 1998 EN 55103-1 1997 EN 55103-2 1997 (excluding Annex A3) EN 61326 1998 EN 61547 1996 EN 50130-4 1996 EN 55104 1995 EN 50083-2 1995 EN 60601-1-2: 1993, 2002 IEC 1800-3 1995 EN 60555 Part 2 1987 EN 60555 Part 3 1987 EN 61000-3-2: 1995, 2000 Limits AS/NZS 61000.3.2 1998 EN 61000-3-3 1995 AS/NZS 61000.3.3 1999 ETS 300 386-1 1994</p>
<p>(A2LA Cert. No. 1627-01) 10/31/03</p>	<p>Page 2 of 11 Electromagnetic Compatibility (EMC)- Part 6: Generic standards- Section 1: Immunity for residential, commercial and light-industrial environments Electromagnetic Compatibility (EMC)- Part 6: Generic standards- Section 2: Immunity for industrial environments Specification for Uninterruptible Power Systems (UPS). Part 2: EMC requirements Information technology equipment – Immunity Characteristics – Limits and methods of measurement. Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Part 1: Emission Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control professional use. Part 2: Immunity Electrical equipment for measurement, control and laboratory use – EMC requirements Equipment for general lighting purposes – EMC immunity requirements Alarm Systems. Part 4: Electromagnetic compatibility. Product family standard: Immunity requirements for components of fire, intruder and social alarm systems. Electromagnetic compatibility immunity – requirements for household appliances, tools and similar apparatus. Product family standard. Cabled distribution systems for television and sound signals. Part 2: Electromagnetic compatibility for equipment. Medical electrical equipment Part 1: general requirements for safety Section 2: Collateral standard: Electromagnetic compatibility – requirements and tests Adjustable speed electrical power drive systems. Part 3: EMC product standard including specific test methods. Disturbances in supply systems caused by household appliances and similar electrical equipment. Part 2: Harmonics Disturbances in supply systems caused by household appliances and similar electrical equipment. Part 3: Voltage fluctuations Electromagnetic compatibility (EMC). Part 3: Limits Section 2: for harmonic current emissions Electromagnetic compatibility (EMC). Part 3: Limits Section 2: Limitation of voltage fluctuations and flicker in low-voltage supply systems. Equipment Engineering (EE); Public telecommunication network equipment electro-magnetic compatibility (EMC) requirements Part 1: Product family overview, compliance criteria and test levels</p>

<p>ETS EN 300 386-2 1997, 1998,</p> <p>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>Electromagnetic compatibility and radio spectrum matters (ERM);</p> <p>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&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>Page 5 of 11</p>	<p>EN 300 328-2:2001 (ERM); v1.2.1</p> <p>EN 301 489-1:2002 (ERM);</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 & 2000, Issue 1 Rev 1</p> <p>Canadian RSS-210 2000 Issue 3, Issue 5 RFS29 1998</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 Scope 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 Scope 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 Radio Services 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</p> <p>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</p> <p>Electromagnetic compatibility and Radio spectrum Matters 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, 27.1 to 960.0 MHz</p> <p>Industry Canada – 900 MHz narrowband personal communications services</p> <p>Industry Canada – Low power license-exempt radio 2001 communication devices</p> <p>Specification for Restricted Radiation Radio Apparatus (New Zealand)</p> <p>Scope A1</p> <p>Scope A2</p> <p>A3</p> <p>A4</p> <p>B1</p> <p>B2</p> <p>B3</p> <p>B4</p> <p>(A2LA Cert. No. 1627-01) 10/31/03</p> <p>Page 6 of 11</p>
<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>Telecommunications Telecommunications Registration; General test methods; Lightning surge; Drop testing; Balance testing; Signal power (metallic and longitudinal); Frequency measurements; Pulse templates; Leakage testing; Impedance testing; Hearing Aid Compatibility testing (excluding volume control); Protocol analysis and Jitter testing.</p> <p><u>Telecom Standards</u></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>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 & S) for wired terminal equipment. Harmonization document information over the OFCOM requirements.</p> <p>Technical Requirements</p> <p>Instruction for Test Conditions for Requirement under Test</p> <p>Connection of terminal equipment to the telephone Terminal Equipment network. Analog and Digital Equipment. TCB Scope C1.</p> <p>Specification for terminal equipment, terminal systems, Network protection devices, connection arrangements and hearing aids compatibility.</p> <p>Bulletin Part 68 Rationale and Measurement Guidelines (Feb 1998)</p> <p>Page 7 of 11</p>	<p>TIA/EIA-IS-968 Equipment Technical Equipment to the TIA/EIA-IS-883 Equipment Connection of Stutter</p> <p>Network TIA-968-A Equipment Technical Equipment to the Telephone T1, TRQ, 6-2001 HDLS4 Digital Harm to the Canada VDSL Test Methods for Issue 1 Digital Subscriber Line (VDSL) Terminal AS/ACIF S002-2001 requirements for AS/ACIF S016-2001 connection to AS/ACIF S031-2001 AS/ACIF S038-2001 Interface AS/ACIF S043-2001 Connection to a Telecommunications Network</p> <p>ITU-T G.703 hierarchical Digital interfaces HKTA 2028 connection of CPE to the circuits at data rate of HKTA 2029 connection of CPE to the circuits at data rate of TBR 1 : 1995 equipment to be connected and leased circuits using a CIIT signaling rate up TBR 2 : 1997 Equipment (DTE) to Networks (PSPDNs) for signaling rates up from CCITT</p> <p>Telecommunications Telephone Terminal Requirements for Connection of Terminal Telephone Network Telecommunications Telephone Terminal Supplemental Technical Requirements for Dial Tone Detection Devices and ADSL Modems to the Telephone Network Telecommunications Telephone Terminal Requirements for Connection of Terminal Network Technical Requirements for SHDSL, HDSL2, Subscriber Line Terminal Equipment to Prevent Telephone Network Industry Terminal Attachment Program Requirements and January 2003 Very-High-Bit-Rate Equipment Analogue interworking and non-interference Customer Equipment for connection to the Telephone Network Requirements for Customer Equipment for hierarchical digital interfaces Requirements for ISDN Basic Access Interface Requirements for ISDN Primary Rate Access Requirements for Customer Equipment for Metallic Local Loop Interface of a – Part 1: General Part 2: Broadband Part 3: DC, Low Frequency AC and Voiceband Physical/electrical characteristics of Network connection specification for PTNs in Hong Kong using digital leased 1544 kbit/s Network connection specification for PTNs in Hong Kong using digital leased 2048 kbit/s Attachment requirements for terminal to circuit switched data networks Recommendation X.21 interface, or functionally and electrically, Recommendation X.21 but operating at any data to, and including, 1 984 kbit/s Attachment requirements for Data Terminal connect to Packet Switched Public Data CCITT Recommendation X.25 interfaces at data to 1 920 kbit/s utilizing interfaces derived Recommendations X.21 and X.21 bit</p> <p>(A2LA Cert. No. 1627-01) 10/31/03 Page 8 of 11</p>

<p>TBR 3 : 1995 + Amdt : 1997 Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access</p> <p>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</p> <p>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</p> <p>TBR 013 : 1996 Business Telecommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Attachment requirements for terminal equipment interface</p> <p>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</p> <p>TBR 24 : 1997 Business Telecommunications (BTC); 34 Mbit/s digital Unstructured and structured leased lines (D34U and D34S); Attachment requirements for terminal equipment interface</p> <p><i>Australia</i> TS 002 : 1997 Analogue Interworking and Non interference Requirements for Customer Equipment Connected to the Public Switched Telephone Network</p> <p>TS 016 : 1997 General Requirements for Customer Equipment Connected to Hierarchical Digital Interfaces</p> <p>TS 031 : 1997 Requirements for ISDN Basic Access Interface</p> <p>TS 038 : 1997 Requirements for ISDN Primary Rate Access Interface</p> <p>AS/ACIF S043.2:2001 Requirements for Customer Equipment for connection to a metallic loop interface of a Telecommunications Network – 2 Broadband</p> <p>Part</p> <p>Product Safety General test methods; Input tests; Electric strength tests; Impulse tests; Permanency of marking tests; Accessibility tests; Energy Hazard measurements; Capacitor discharge tests; Humidity conditioning; Earthing tests; Limited power source measurements; Stability tests; Steel ball tests; Lithium Battery Reverse Current measurements; Leakage current tests; Transformer abnormal tests; Telecom leakage tests; Over voltage/power cross tests (<i>excluding x-ray tests</i>).</p> <p><u>Product Safety Standards</u></p> <p><i>Specific Product Safety Standards</i> IEC 950 1991 Safety of information technology equipment including Amendments 1, 2, 3, and 4 electrical business equipment.</p> <p>UL 1950 1998 Safety of information technology equipment, including electrical business equipment.</p> <p>CSA C22.2 No. 950-95 Safety of Information Technology Equipment (UL 1950)</p> <p>UL 60950 2000 Safety of information technology equipment</p> <p>(A2LA Cert. No. 1627-01) 10/31/03</p>	<p>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</p> <p>AS/NZS 3260 Supp 1 1996</p> <p>ACA TS 001 1997</p> <p>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</p> <p>Canadian C22.2 No. 1-94 (1-98) 1998 EN 60065 1994</p> <p>IEC 60825 1990</p> <p>EN 60825-1 1994 IEC 60825-1 2001 IEC 60825-2 2000-5 systems IEC 60825-4 1997-11 IEC 60335-1 1995 (<i>Including AM2 – 1997 & AM 12 – 1997</i>) EN 60335-1 2001 UL 60335-1 1998 CAN/CSA E335-1 1994</p> <p>(A2LA Cert. No. 1627-01) 10/31/03</p>
<p>UL 61010A-1 : 2002 Electrical equipment for laboratory use; part 1: General requirements</p> <p>EN 61010-1 : 2001 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements</p> <p>AS/NZS 60950 : 2000 Safety information technology equipment</p> <p>Environmental²</p> <p><u>Environmental Standards</u> GR-63-CORE ETS 300 019</p> <p>NEBS Requirements: Physical Protection Environmental conditions and environmental tests For (vibration up to 1000Hz) telecommunications equipment</p> <p>² 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 9 of 11</p> <p>Page 10 of 11</p> <p>Page 11 of 11</p>