



Test Report

Report No	ED0894-1
Client	Sensicast Systems, Inc. 220-3 Reservoir Street Needham, MA 02494
Phone Fax FRN	(781)-453-4555 (781)-453-0601 0009860149
EUT	H900 Mesh/Bridge Nodes & OAS/EMS Nodes
FCC ID	RNBF19D8MN9LQ2WFA
Equipment Type Equipment Code	Spread Spectrum Transmitter 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 50Ω/50µH 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 OAS100	K26394 K26405	antenna connectorized
EUT Description:	"node"		
EUT Max Frequency:	927.3MHz		
Support Equipment:	MN	SN	FCC ID
none			
EUT Cables:	Qty	Shielded?	Length
twisted pair	4	No	1m
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

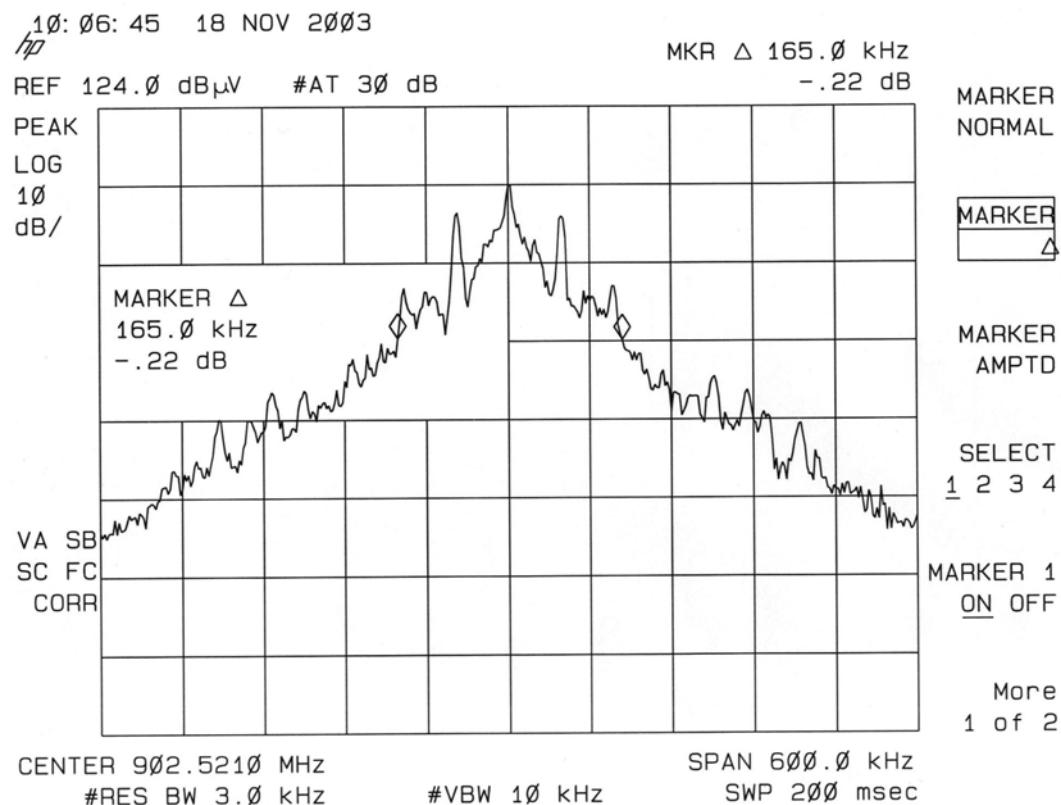
	MN	SN	
EUT:	MESH100	K26447	antenna
	MESH100	K26444	connectorized
EUT Description: "coordinator"			
EUT Max Frequency: 927.3MHz			
Support Equipment:		MN	
CUI Inc. AC adaptor	DV-6250		
-OR-			
Good Power Electronics Ltd			
AC adaptor	GPU280600250WD00		
EUT Cables:		Qty	Shielded?
DB9 serial cable	1	No	1.5m
DC Power	1	No	2m
twisted pair	3	No	1m
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.

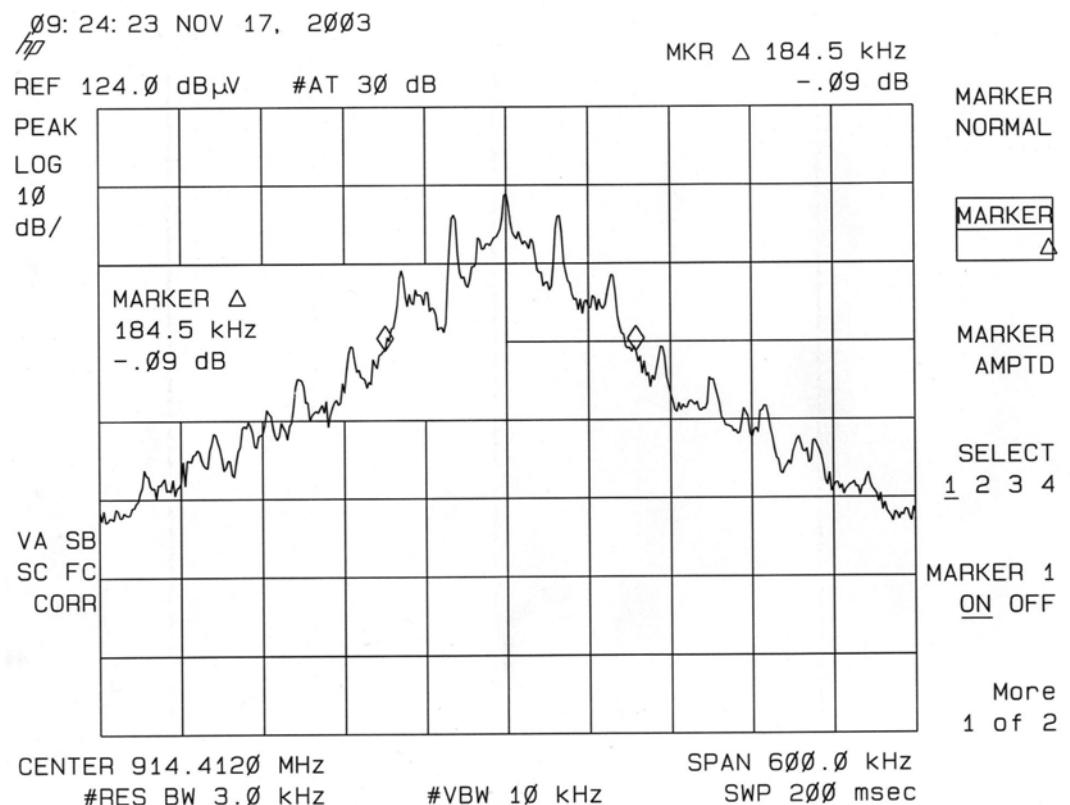
ANALYZER PLOT



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

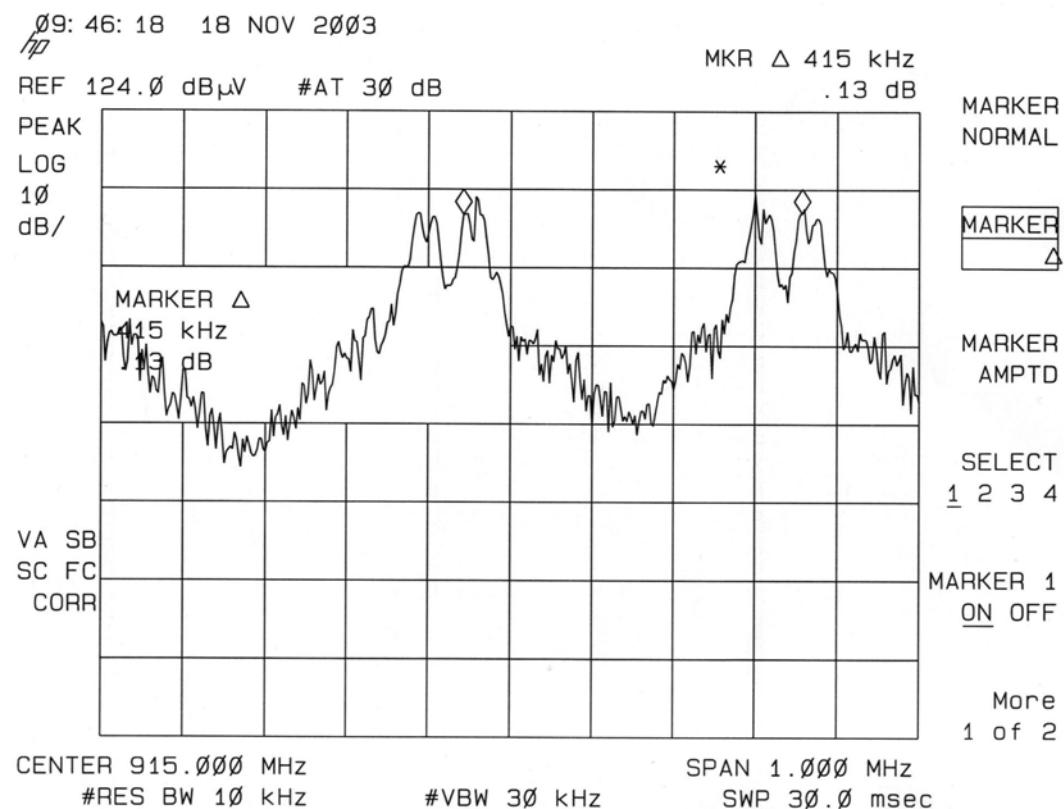
“Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.” [15.247(a)(1)]

20dB bandwidth = 165kHz (see “20dB Bandwidth” section)

MEASUREMENT

Channel separation = 415kHz

ANALYZER PLOT



Channel Separation - Coordinator

REQUIREMENT

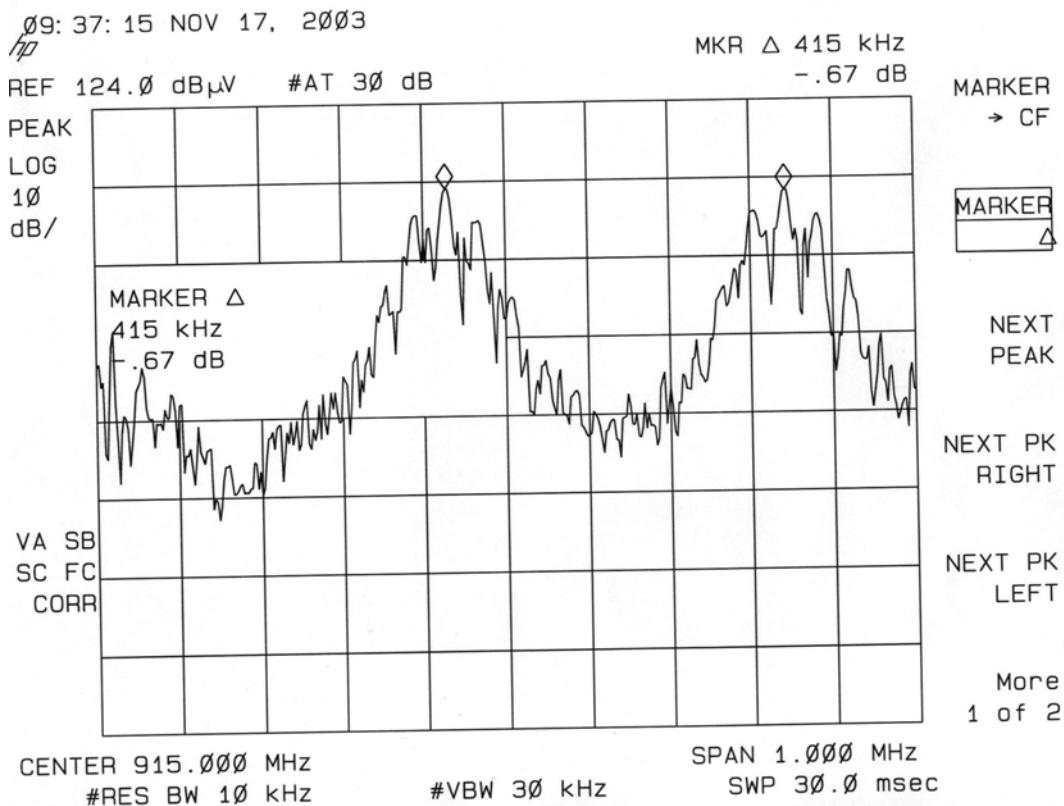
“Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.” [15.247(a)(1)]

20dB bandwidth = 184.5kHz (see “20dB Bandwidth” section)

MEASUREMENT

Channel separation = 415kHz

ANALYZER PLOT



Number of Hopping Frequencies - Node

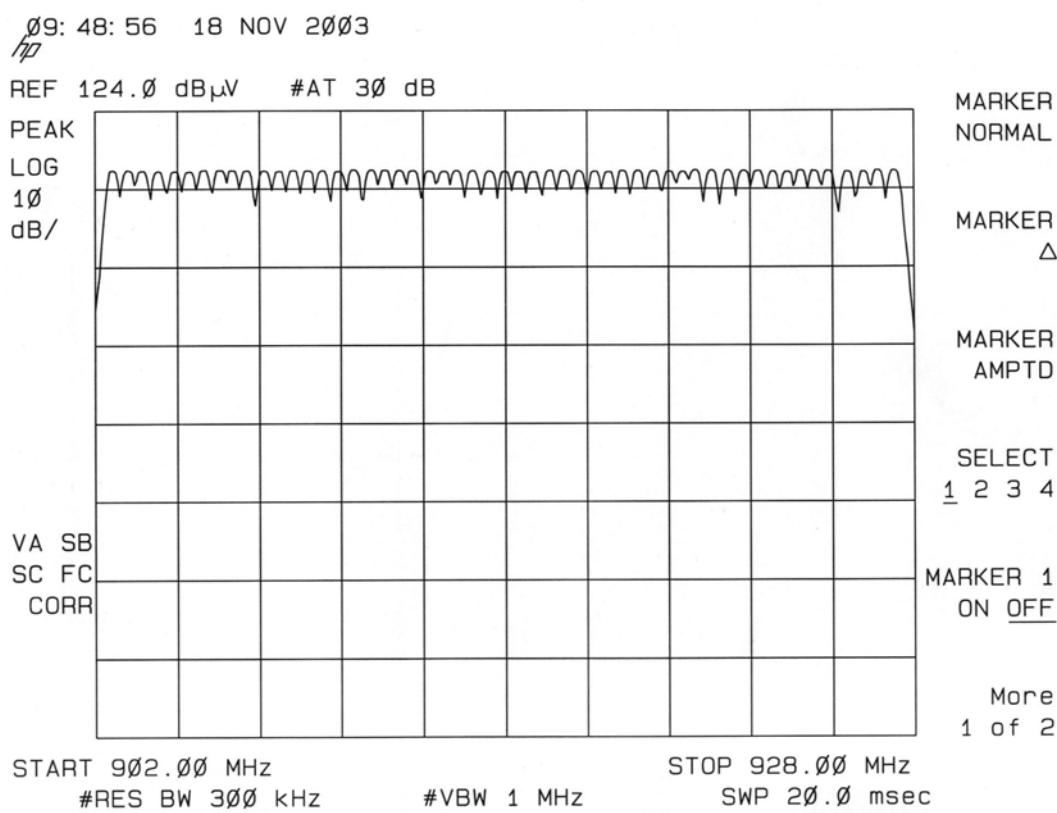
REQUIREMENT

“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

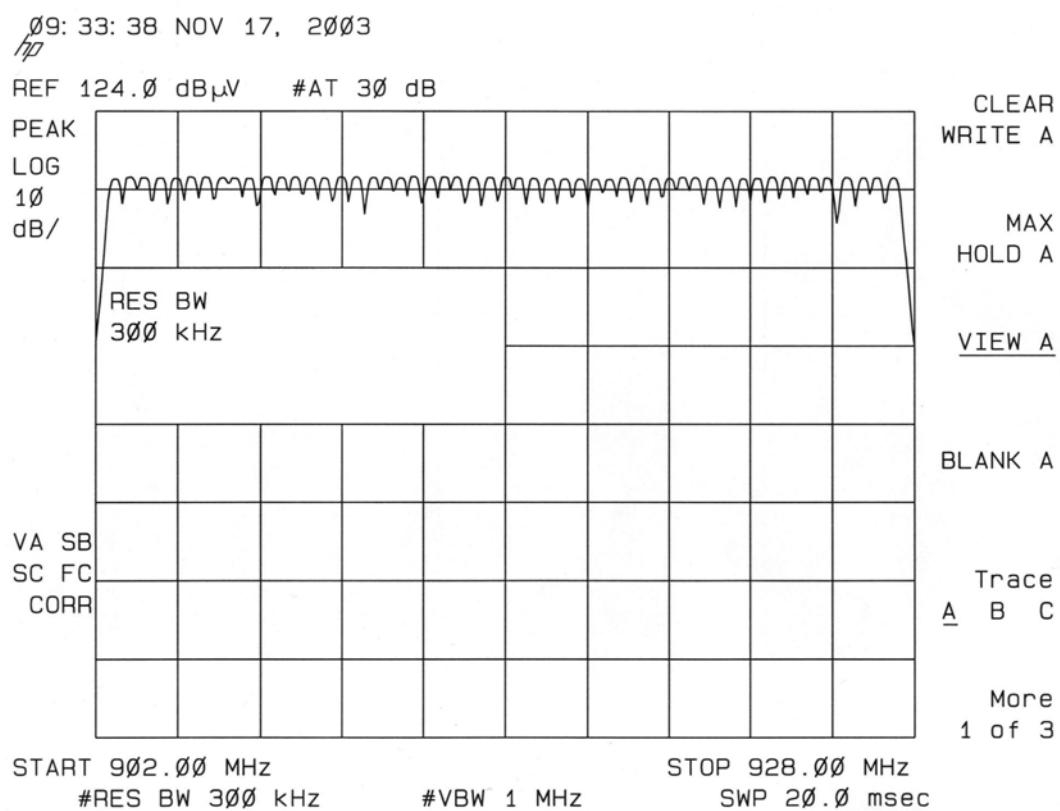
REQUIREMENT

“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)]

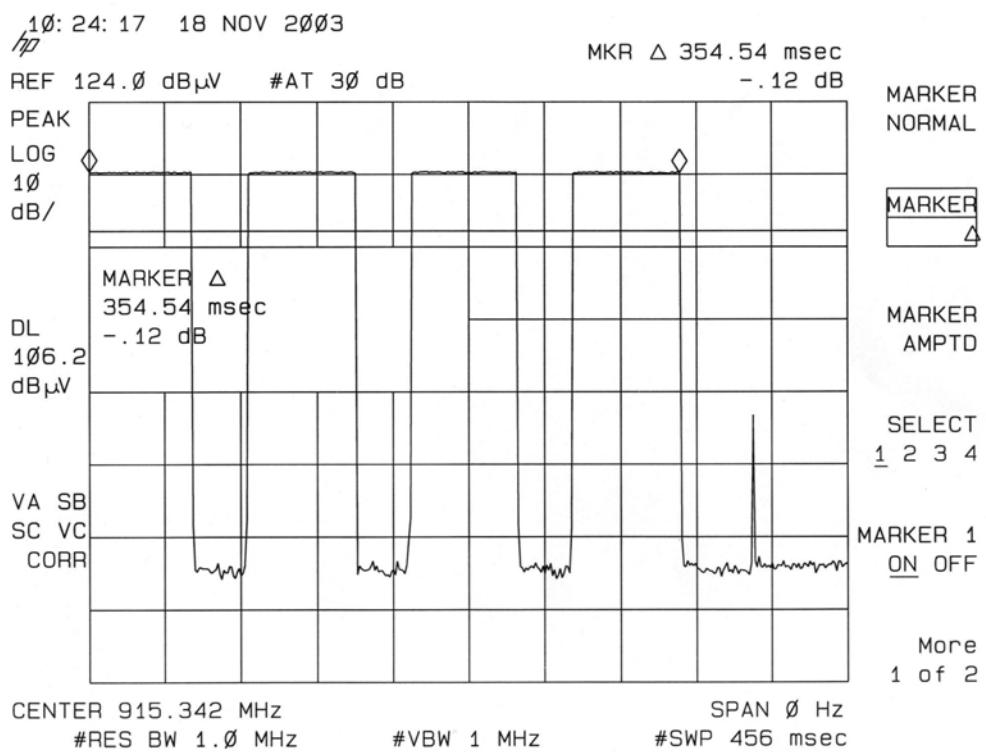
MEASUREMENTS

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:

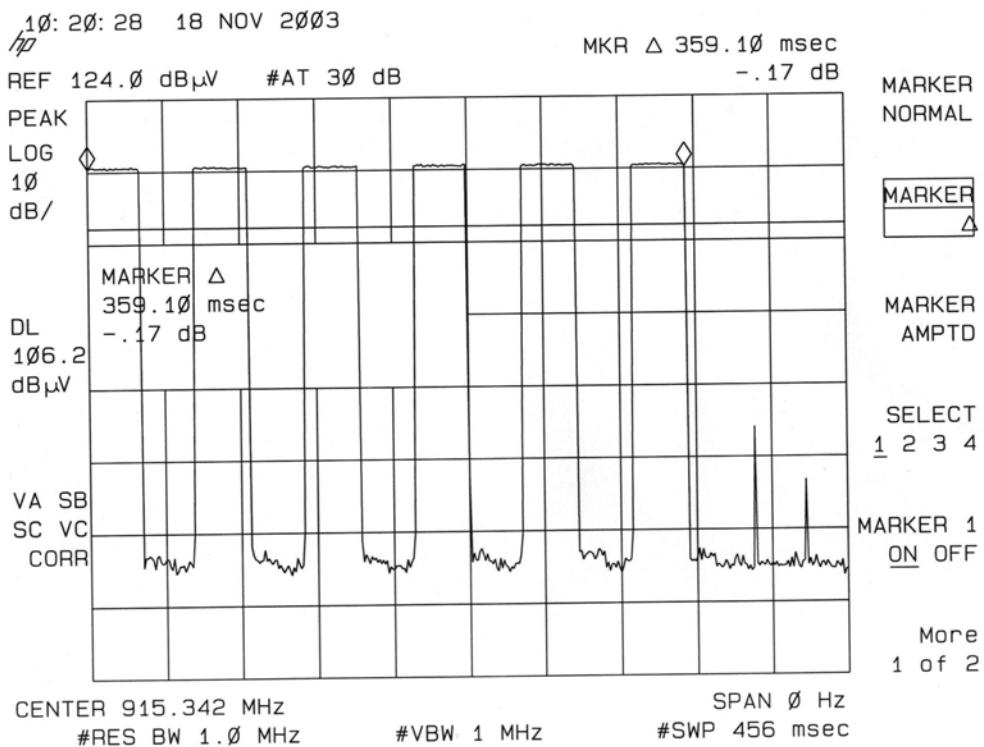
19.2kbaud – 354.5ms
 38.4kbaud – 359.1ms
 76.8kbaud – 314.6ms

ANALYZER PLOTS

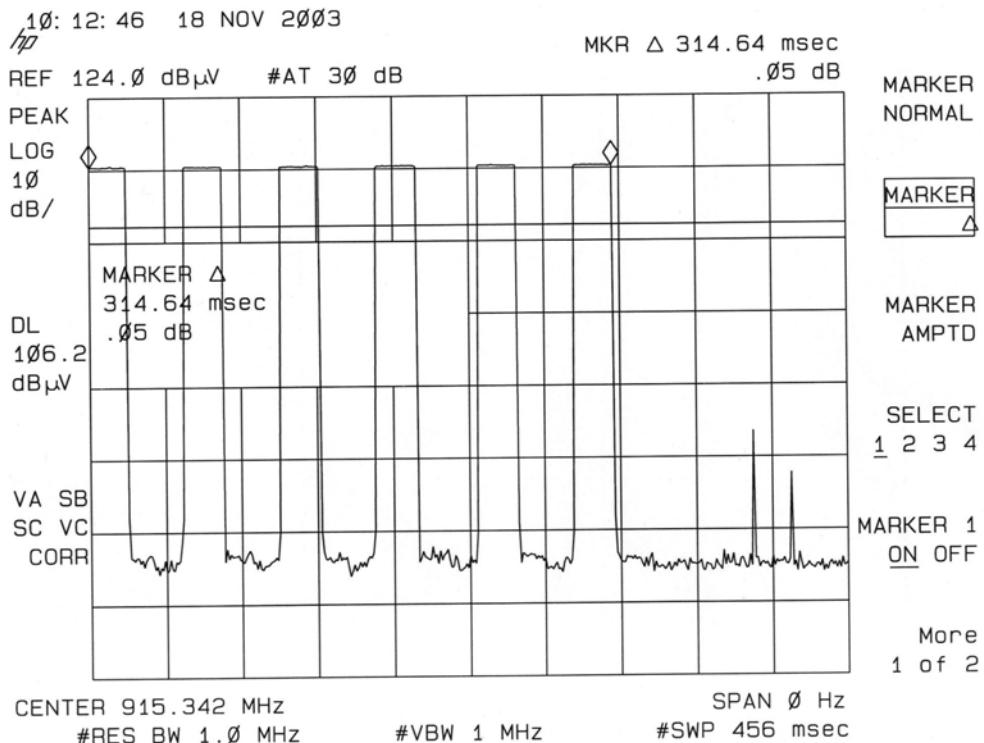
Dwell Time - 19.2kbaud



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:

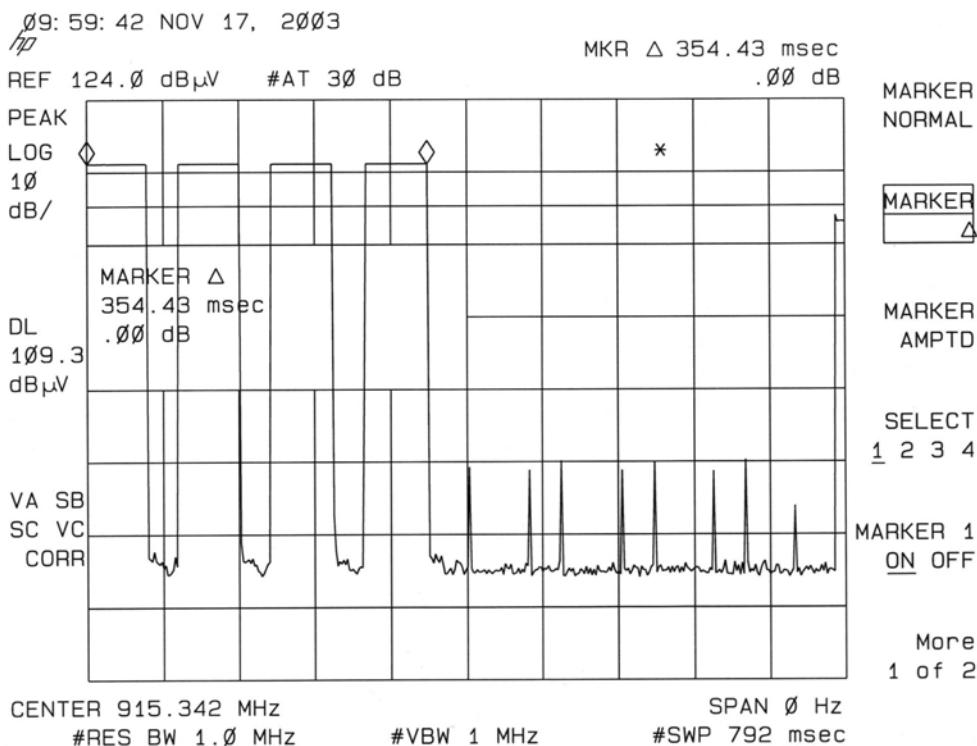
19.2kbaud – 354.4ms

38.4kbaud – 357.7ms

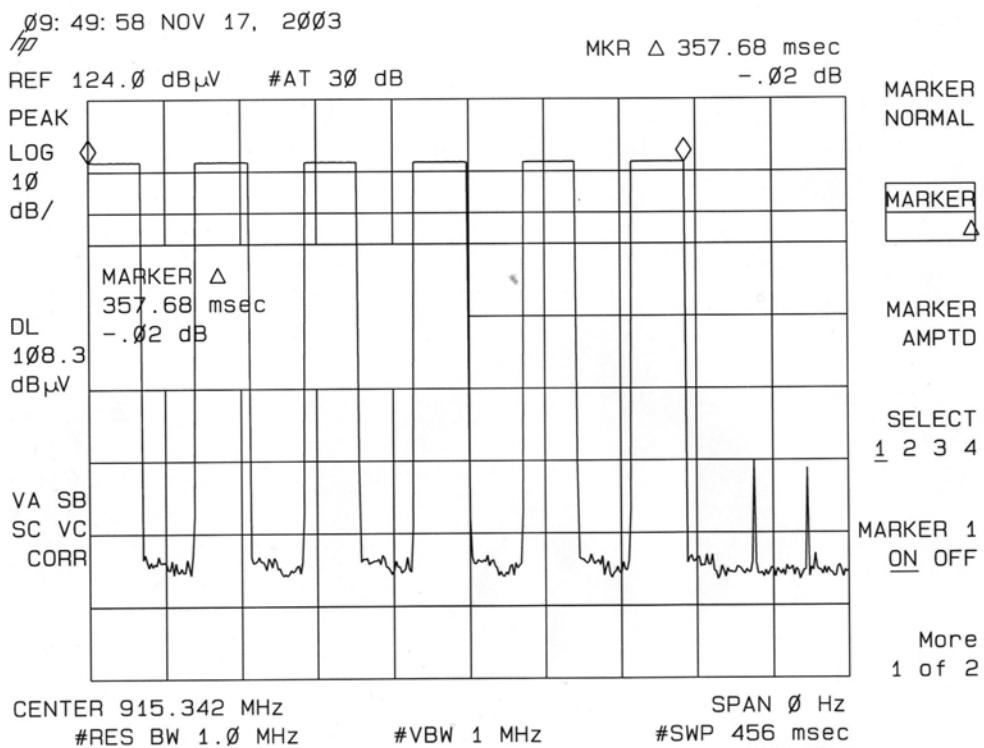
76.8kbaud – 313.3ms

ANALYZER PLOTS

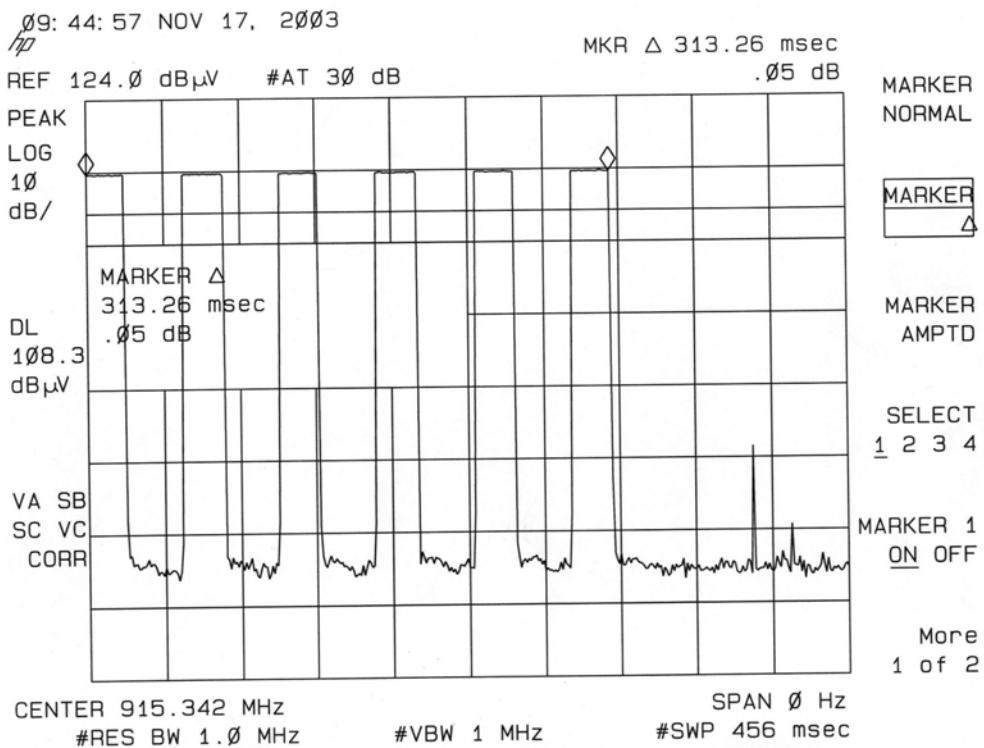
Dwell Time - 19.2kbaud



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

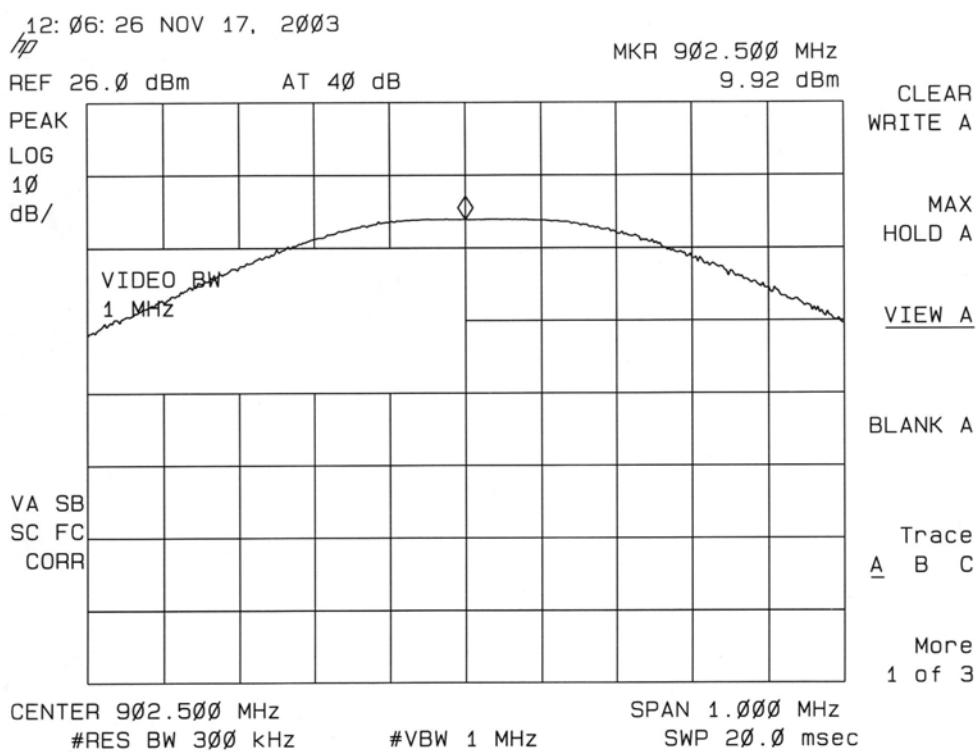
Peak Output Power

Curtis-Straus 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)		
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

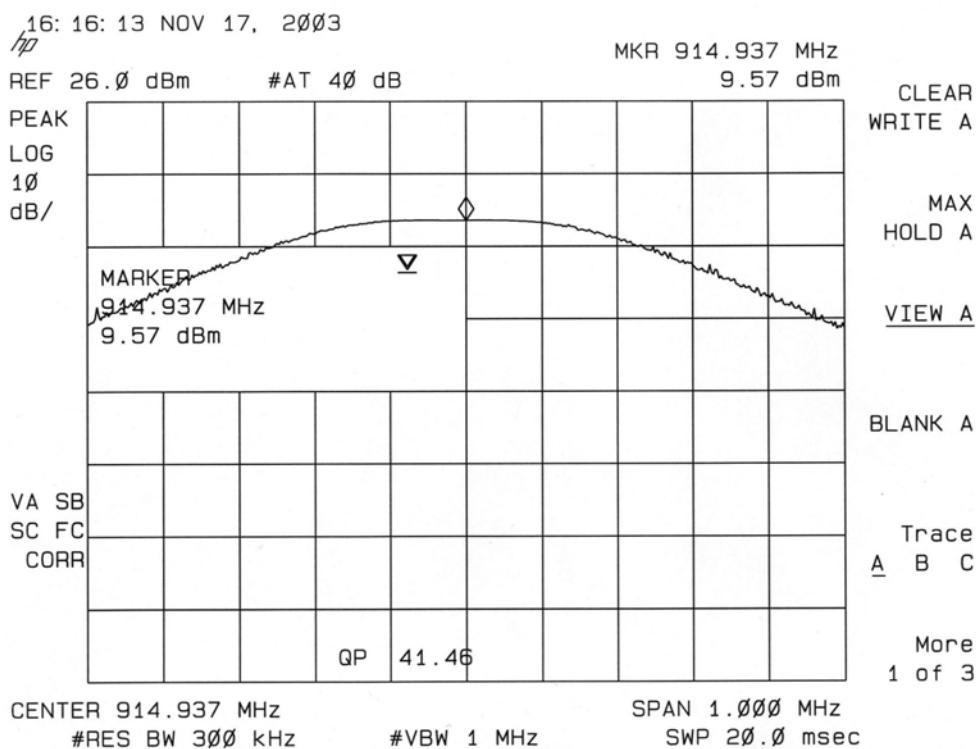
Peak Output Power

Curtis-Straus 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)		
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

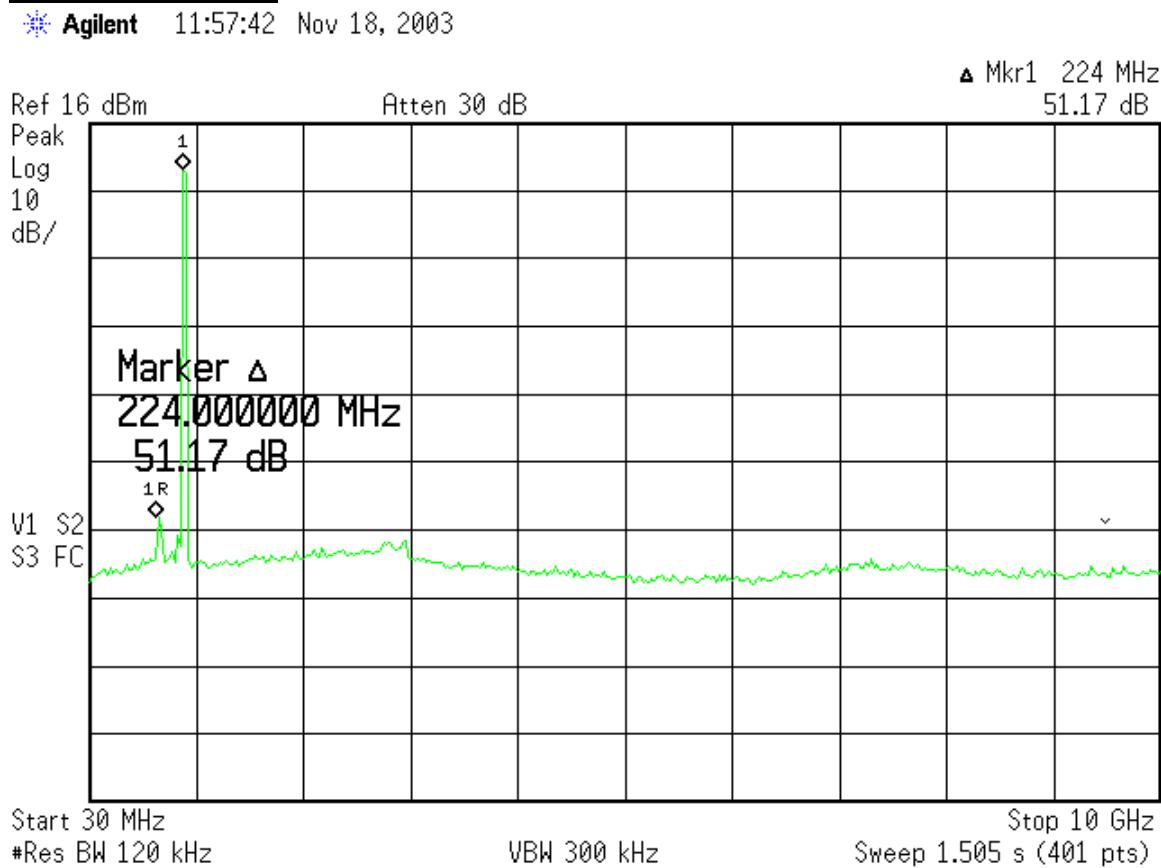
LIMIT

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

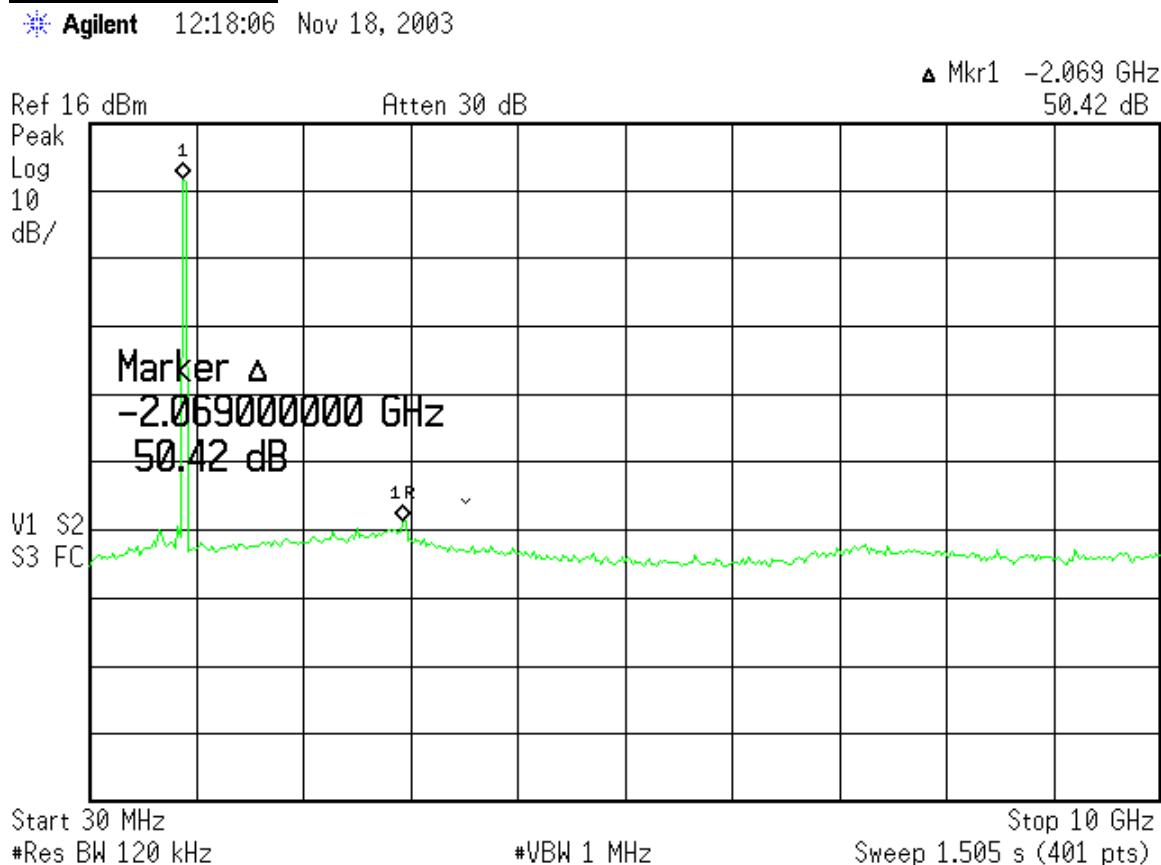


Conducted Spurious Emissions - Coordinator**LIMIT**

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

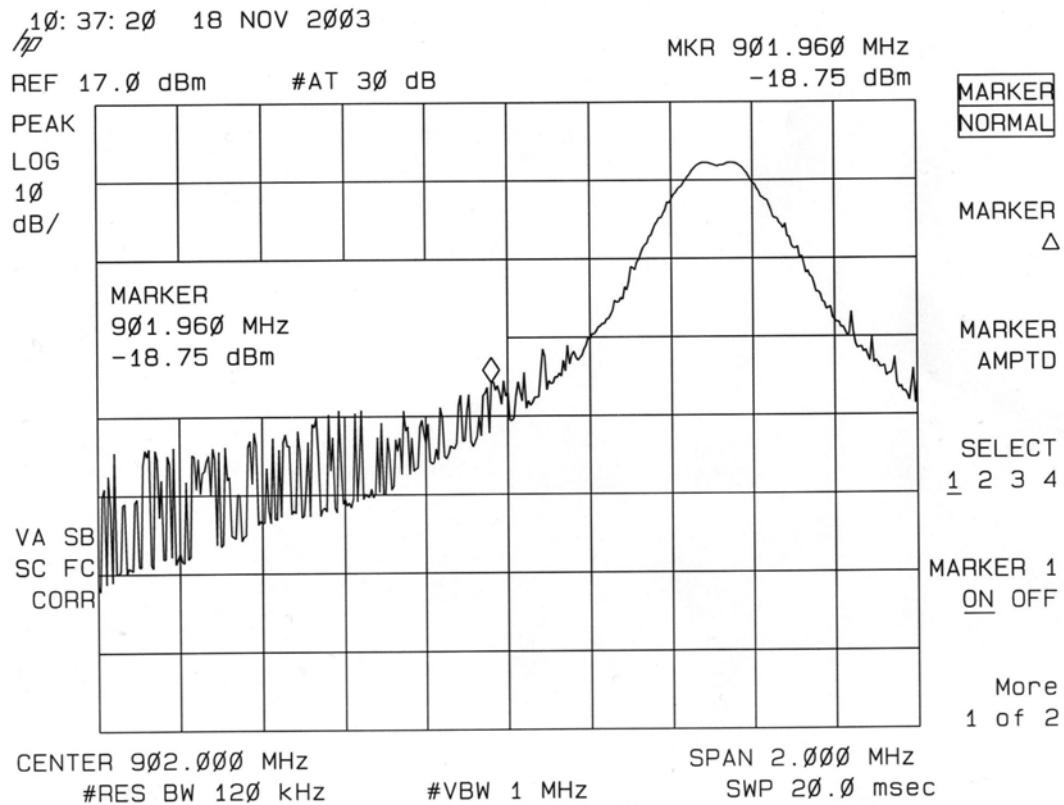
Peak: 20dB down from fundamental [15.247(c)]

RESULTS

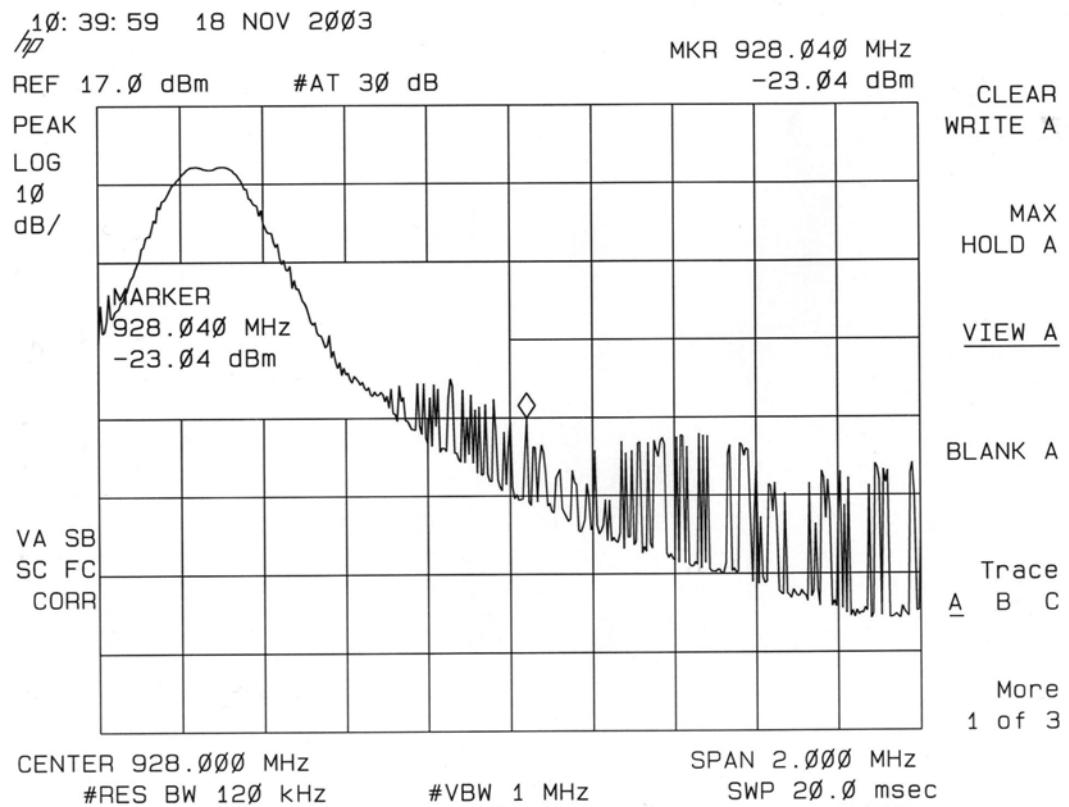
It can easily be seen in the plots shown below that the conducted band edges are at least 20dB down from the peak of the fundamental.

ANALYZER PLOTS

Channel 0 - Low Band Edge



Channel 52 – High Band Edge

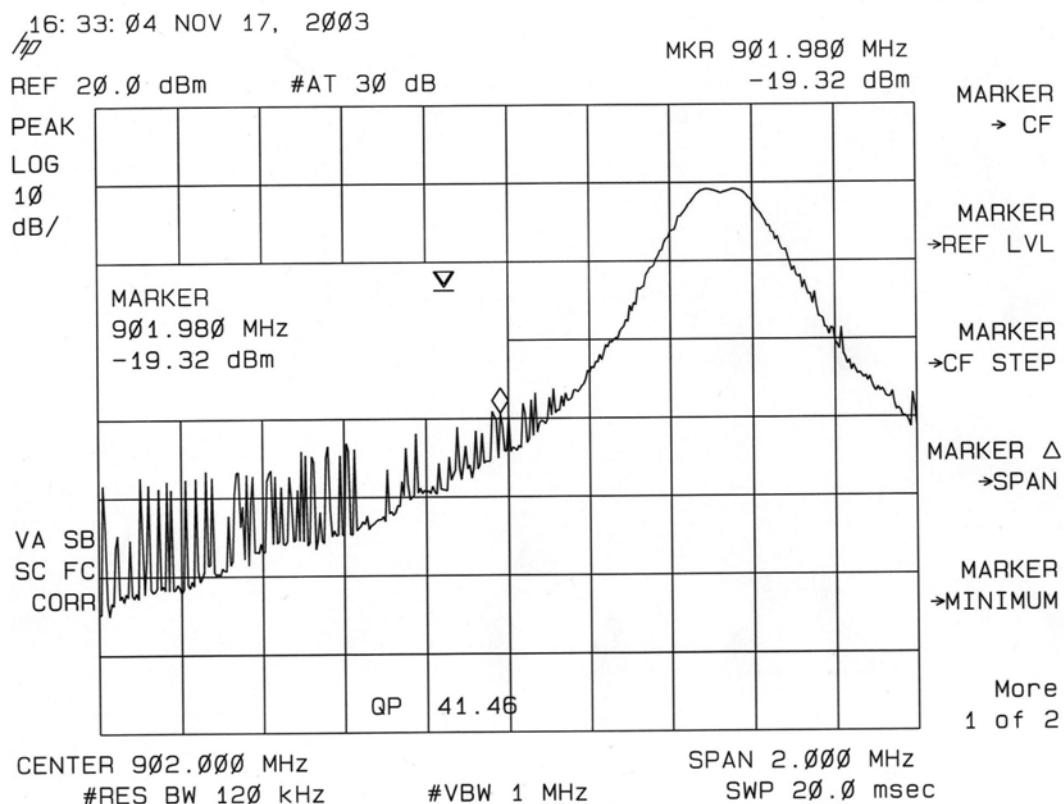


Conducted Band Edges - Coordinator**LIMITS**

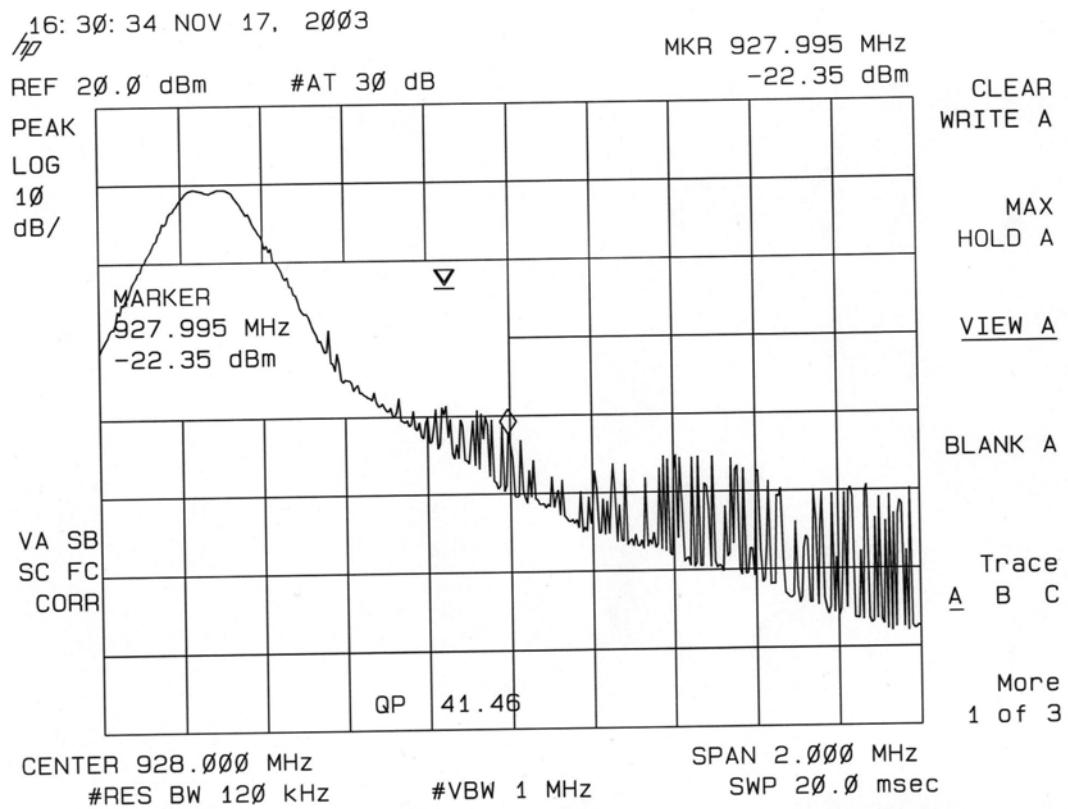
Peak: 20dB down from fundamental [15.247(c)]

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

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

MEASUREMENTS

EIRP/Directional Gain										Curtis-Straus 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 (dB μ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB μ V/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 (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: 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 (dB μ V)	QP2 (dB μ V)	AV1 (dB μ V)	AV2 (dB μ V)		qp Limit (dB μ V)	qp Margin dB	AVE Limit (dB μ V)	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										Curtis-Straus 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 (dB μ V)	QP2 (dB μ V)	AV1 (dB μ V)	AV2 (dB μ V)		qp Limit (dB μ V)	qp Margin dB	AVE Limit (dB μ V)	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						Curtis-Straus 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						Curtis-Straus 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: 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 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

SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999 CURTIS-STRAUSS¹ 527 Great Road Littleton, MA 01460 Barry Quinlan Phone: 978-486-8880 ELECTRICAL Valid until: July 31, 2005 Certificate Number: 1627-01		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 (A2LA Cert. No. 1627-01) 10/31/03	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 (<i>except discontinuous disturbances</i>) 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 (<i>except discontinuous disturbances</i>) 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 (<i>except discontinuous disturbances</i>) 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		
<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	Limits and methods of measurement of radio disturbance characteristics of information technology equipment. Limits and methods of measurement of radio interference characteristics of information technology equipment. Limits and methods of measurement of radio disturbance characteristics of information technology equipment. Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement of apparatus Australian/New Zealand Standard Limits and methods of measurement of radio disturbance characteristics of information technology equipment Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.	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	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		
<i>Immunity</i> CNS13783-1 SABS CISPR 14-1 1993 SABS CISPR 14-2 1997 + A1:2001 (A2LA Cert. No. 1627-01) 10/31/03	Page 1 of 11	(A2LA Cert. No. 1627-01) 10/31/03	Page 2 of 11		
<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 EU Product Family Standards EN 50081-1 1992 EN 50081-2 1993 EN 50082-1 1992, 1998 EN 50082-2 1995 (A2LA Cert. No. 1627-01) 10/31/03	Immunity requirements for household appliances, tools and similar apparatus. Limits and methods of measurement of immunity characteristics (<i>associated group only</i>) 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 5: Surge immunity test. Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 6: Immunity to conducted disturbances, induce by radio-frequency fields. Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 8: Power frequency magnetic field immunity test. (EMC) Part 4: Testing and measurement techniques. Section 11: Voltage dips, short interruptions and voltage Variations immunity tests. Electromagnetic compatibility (EMC). Part 2: Environment, Section 2: Compatibility levels for low-frequency conducted disturbances and signaling in public low-voltage power supply systems (IEC 1000-2-2:1990) 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	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	(A2LA Cert. No. 1627-01) 10/31/03	Page 3 of 11	Page 4 of 11

<p>ETS EN 300 386-2 1997, 1998, ETS EN 300 386 2000 v1.2.1, 2001 v1.3.1</p> <p>ETS 300 132-1 1996</p> <p>ETS 300 132-2 1996</p> <p>ETR 283 1997</p> <p>EU radio standards (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>Electromagnetic compatibility and Radio spectrum matters (ERM); Telecommunication network equipment; Electromagnetic compatibility (EMC) requirements; Part 2: Product family standard.</p> <p>Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 1: Operated by alternating current (ac) derived from direct current (dc) sources</p> <p>Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc)</p> <p>Equipment Engineering (EE); Transient voltages at Interface A on telecommunications direct current (DC) power distributions.</p> <p>Electromagnetic compatibility and Radio spectrum matters (ERM); Electromagnetic Compatibility (EMC) standard for fixed radio links and ancillary equipment (ETS)</p> <p>Electromagnetic compatibility and Radio spectrum matters (ERM); Short range devices (SRD); Technical characteristics and test methods for radio equipment in the range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz</p> <p>Radio Equipment and Systems (RES); Wideband transmission systems; Technical characteristics and test conditions for data transmission equipment operating in the 2.4 GHz ISM band and using spread spectrum modulation techniques</p> <p>Electromagnetic compatibility and Radio spectrum matters (ERM); Short range devices; Technical characteristics and test methods for radio equipment to be used in the 1 GHz to 40 GHz frequency range</p> <p>Broadband Radio Access Networks (BRAN); 5 GHz (draft) high performance RLAN; Harmonized EN covering Essential requirements of article 3.2 of the R&TTE Directive</p> <p>Broadband Radio Access Networks (BRAN); High Performance Radio Local Area Network (HIPERLAN) Type 1; Conformance testing specification; Part 1: Radio Type approval and Radio Frequency (RF) conformance test specification</p> <p>Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for 2.4 GHz wideband transmission systems and 5 GHz high performance RLAN equipment</p>	<p>EN 300 328-2:2001 (ERM), v1.2.1</p> <p>EN 301 489-1:2002 (ERM)</p> <p>EN 60669-2-1:2002</p> <p>Canada Radio Standards 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>FCC Standards</p> <p>47 CFR FCC low power transmitters operating on frequencies below 1 GHz, emergency alert systems, unintentional radiators and ISM devices.</p> <p>47 CFR FCC low power transmitters operating on frequencies above 1 GHz, with the exception of spread spectrum devices.</p> <p>47 CFR FCC Unlicensed Personal Communications System (PCS) devices</p> <p>47 CFR FCC Unlicensed National 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 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, 27.41 to 960.0 MHz</p> <p>Industry Canada – 900 MHz narrowband personal communications services</p> <p>Industry Canada – Low power license-exempt radio 2001 communication devices</p> <p>Specification for Restricted Radiation Radio Apparatus (New Zealand)</p>
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<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>ANSI EMC Standards ANSI C63.4: 1992, 1999, 2001</p> <p>ANSI C63.5 1988</p> <p>IEEE EMC Standards IEEE C62.41: 1980, 1991</p> <p>Swedish EMC Standards BAKOM 3336.3 1995</p> <p>South African EMC standards other than CISPR equivalents SABS 1718-1: 1996</p> <p>Japanese VCCI Standards 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 (<i>excluding volume control</i>); Protocol analysis and Jitter testing.</p> <p>Telecom Standards</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>South African Bureau of Standards: Specification for Gaming equipment Part 1: Casino equipment.</p> <p>Technical Requirements Instruction for Test Conditions for Requirement under Test</p>	<p>TIA/EIA-IS-968 Equipment Technical Equipment to the Telephone</p> <p>TIA/EIA-IS-883 Equipment Connection of Stutter</p> <p>Network TIA-968-A Equipment Technical Equipment to the Telephone</p> <p>T1.TRQ.6-2001 HDSL4 Digital</p> <p>Canada VDSL Test Methods for Issue 1</p> <p>AS/ACIF S002-2001 AS/ACIP S002-2001 requirements for Public Switched</p> <p>AS/ACIP S016-2001 connection to</p> <p>AS/ACIP S031-2001 AS/ACIP S038-2001</p> <p>Interface AS/ACIP S043-2001</p> <p>AS/ACIP S043-2001 AS/ACIP S043-2001 requirements for Customer Equipment for</p> <p>AS/ACIP S043-2001 Connection to a Telecommunications Network</p> <p>ITU-T G.703 hierarchical Digital interfaces</p> <p>HKTA 2028 connection of CPE to the</p> <p>HWTR 2028 connection of CPE to the</p> <p>TBR 1 : 1995 signaling rate up</p> <p>TBR 2 : 1997 Equipment (DTE) to</p> <p>Networks (PSPDNs) for signaling rates up from CCITT</p> <p>Part 2 : Broadband Part 3 : DC, Low Frequency AC and Voiceband</p> <p>Physical/electrical characteristics of Network connection specification for</p> <p>Network connection specification for Network connection specification for</p> <p>Attachment requirements for terminal to circuit switched data networks</p> <p>Recommendation X.21 interface and leased circuits using a CITT</p> <p>functionally and electrically at an interface physically, or</p> <p>Recommendation X.21 but operating at any data to, and including, 1 984 kbit/s</p> <p>Attachment requirements for Data Terminal connect to Packet Switched Public Data</p> <p>CCITT Recommendation X.25 interfaces at data to 1 920 kbit/s utilizing interfaces derived</p> <p>Recommendations X.21 and X.21 bit</p> <p>(A2LA Cert. No. 1627-01) 10/31/03 Page 8 of 11</p>	<p>Telecommunications Telephone Terminal Requirements for Connection of Terminal Telephone Network</p> <p>Telecommunications Telephone Terminal Supplemental Technical Requirements for Dial Tone Detection Devices and ADSL Modems to the Telephone</p> <p>Telecommunications Telephone Terminal Requirements for Connection of Terminal Network</p> <p>Technical Requirements for SHDSL, HDSL2, Subscriber Line Terminal Equipment to Prevent Telephone Network Industry Terminal Attachment Program Requirements and</p> <p>January 2001 Very-High-Bit-Rate (VDSL) Terminal Equipment</p> <p>Analogue interworking and non-interference Customer Equipment for connection to the Telephone Network</p> <p>Requirements for Customer Equipment for hierarchical digital interfaces</p> <p>Requirements for ISDN Basic Access Interface Requirements for ISDN Primary Rate Access</p> <p>Requirements for Customer Equipment for Metallic Local Loop Interface of a Telecommunications Network</p> <p>Part 2 : Broadband</p> <p>Part 3 : DC, Low Frequency AC and Voiceband</p> <p>Physical/electrical characteristics of</p> <p>Network connection specification for</p> <p>Network connection specification for</p> <p>Attachment requirements for terminal</p> <p>to circuit switched data networks</p> <p>Recommendation X.21 interface, or</p> <p>functionally and electrically</p> <p>Recommendation X.21 but operating at any data</p> <p>to, and including, 1 984 kbit/s</p> <p>Attachment requirements for Data Terminal</p> <p>connect to Packet Switched Public Data</p> <p>CCITT Recommendation X.25 interfaces at data</p> <p>to 1 920 kbit/s utilizing interfaces derived</p> <p>Recommendations X.21 and X.21 bit</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	IEC 60950 2000 EN 60950 1997, 1998, 2000 IEC 60950-1 2001 UL 60950-1 2003 CSA C22.2 No. 60950-00 CSA C22.2 No. 60950-1 03 AS/NZS 3260 1993	Safety of information technology equipment Safety of information technology equipment, including Electrical business equipment.
TBR 4 : 1995 + Amdt : 1997	Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN primary rate access		
TBR 012 : 1993 + Amdt : 1996	Business Telecommunications (BT); Open Network Provision (ONP) technical requirements; 2 048 kbit/s digital unstructured leased line (D2048U) Attachment requirements for terminal equipment	AS/NZS 3260 Supp 1 1996	Approval and test specification – Safety of information technology equipment including electrical business Equipment.
TBR 013 : 1996	Business TeleCommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Attachment requirements for terminal equipment interface	ACA TS 001 1997	Approval and test specification – Safety of information technology equipment including electrical business equipment – Alphabetical reference index to IEC 950 (Supplement to AS/NZS 3260:1993)
TBR 21 : 1998	Terminal Equipment (TE); Attachment requirements for pan-European approval for connection to the analogue Public Switched Telephone Networks (PSTNs) of TE (excluding TE supporting the voice telephony service) in which network addressing, if provided, is by means of Dual Tone Multi Frequency (DTMF) signaling	UL 1459 1995 IEC 1010-1 1990 IEC 61010-1 1993 EN 61010-1 1993, 2001 IEC 61010-1 2001 UL 61010B-1 2003 UL 3101-1 1993 CAN/CSA 1010-1 1999 (<i>Including AM 2</i>) UL 3111-1 1996 UL 3121-1 1995 IEC 60601-1 1995 EN 60601-1 1995 (<i>Including AM 2</i>) UL 2601-1 1997 IEC 60065 1998, 2000 ANSI/UL 6500: 1998 CAN/CSA 60065-00 AS/NZS 3250 1995 AS/NZS 60065 2000	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 24 : 1997	Business TeleCommunications (BTC); 34 Mbit/s digital Unstructured and structured leased lines (D34U and D34S); Attachment requirements for terminal equipment interface		Electrical equipment for laboratory use Part 1: General requirements.
<i>Australia</i> TS 002 : 1997	Analogue Interworking and Non interference Requirements for Customer Equipment Connected to the Public Switched Telephone Network		Electrical measuring and test equipment. Part 1: General requirements.
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		Medical electrical equipment.
TS 038 : 1997	Requirements for ISDN Primary Rate Access Interface		Medical electrical equipment. Part 1: General Requirements for safety.
AS/ACIF S043.2:2001	Requirements for Customer Equipment for connection to a metallic loop interface of a Telecommunications Network – 2 Broadband		Audio, video and similar electronic apparatus – Safety requirements
Part			Audio/video and musical instrument apparatus for Household, commercial and similar general use
Product Safety			Australian/New Zealand Standard – Approval and test Specification – Mains operated electronic and related Equipment for household and similar general use
General test methods; Input tests; Electric strength tests; Impulse tests; Permanency of marking tests; Accessibility tests; Energy Hazard measurements; Capacitor discharge tests; Humidity conditioning; Earthing tests; Limited power source measurements; Stability tests; Steel ball tests; Lithium Battery Reverse Current measurements; Leakage current tests; Transformer abnormal tests; Telecom leakage tests; Over voltage/power cross tests (<i>excluding x-ray tests</i>).			Audio, video and similar electronic equipment. Consumer and 1994, commercial products
<u>Product Safety Standards</u>	<u>Title</u>		Safety requirements for main operated electronic and related apparatus for household and similar general use.
<i>Specific Product Safety Standards</i>			Radiation safety of laser products, 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 1: equipment Classification, requirements and user's guide.
UL 1950 1998	Safety of information technology equipment, including electrical business equipment.		Safety of laser products – Part 2: Safety of optical communication systems
CSA C22.2 No.950-95	Safety of Information Technology Equipment (UL 1950)		IEC 60825-4 1997-11 IEC 60335-1 1995
UL 60950 2000	Safety of information technology equipment		<i>(Including AM2 – 1997 & AM 12 – 1997)</i> Part 1: General requirements
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UL 61010A-1 : 2002	Electrical equipment for laboratory use; part 1: General requirements		
EN 61010-1 : 2001	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements		
AS/NZS 60950 : 2000	Safety information technology equipment		
<i>Environmental</i> ²			
<u>Environmental Standards</u>	<u>Title</u>		
GR-63-CORE	NEBS Requirements: Physical Protection		
ETS 300 019	Environmental conditions and environmental tests For (vibration up to 1000Hz) telecommunications equipment		

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

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