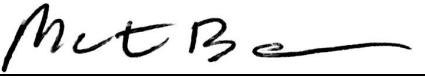




**CURTIS-STRAS**

# Test Report

Report No	EJ1068-1
Client	Novalab, LLC.
Address	19 Aladdin Rd. Windham, NH 03087
Phone	978-835-3198
Items tested	MAD Sensor
FCC ID	XMPNL7352
FRN	0018986281
Equipment Type	Part 15.247 Digital Transmission Systems
Equipment Code	DTS
FCC Rule Parts	47 CFR 15.247
Test Dates	January 6-11, 2010
Results	As detailed within this report
Prepared by	 Matthew Burman – Test Engineer
Authorized by	 Mairaj Hussain – EMC Supervisor
Issue Date	<u>February 16, 2010</u>
Conditions of Issue	This Test Report is issued subject to the conditions stated in the 'Conditions of Testing' section on page 23 of this report.

Curtis-Straus LLC is accredited to ISO/IEC 17025 by A2LA for the specific scope of accreditation under Certificate Number 1627-01. This report may contain data which is not covered by the A2LA accreditation. See our scope of accreditation at the end of this test report. Any opinions or interpretations expressed in this report are outside the scope of our A2LA accreditation as A2LA only accredits testing.

Testing Cert. No. 1627-01

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



page 1 of 27

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Form Final Report REV 7-20-07 (DW)

## Summary

This test report supports an application for certification of a transmitter operating pursuant to 47 CFR 15.247. The product is the MAD Sensor. It is a transmitter that operates in the range 906.2-923.8MHz

We found that the product met the above requirements with modification. Scott Keller from Novalab, LLC. was present during the testing. The test sample was received in good condition.

## Test Methodology

Radiated emission testing was performed according to the procedures specified in ANSI C63.4 (2003). Radiated Emissions were maximized by rotating the device around three orthogonal axes as well as varying the test antenna's height and polarity. The device antenna cannot be maximized separately.

Conducted emission at the antenna port was performed, as required by rule section.

The EUT operating voltage is 3.6Vdc, through battery power; fresh batteries were used to ensure proper voltage.

The environmental conditions are shown below.

Date	Temperature	Humidity
1-6-2010	17°C	24%
1-11-2010	26°C	33%

The following bandwidths were used during radiated spurious and line conducted emissions.

Frequency	RBW	VBW
0.15-30MHz	9kHz	30kHz
30-1000MHz	120kHz	1MHz
1-25GHz	1MHz	3MHz

Release Control Record  
Issue No. 1 Reason for change  
Original Release

Date Issued  
February 16, 2010

**Product Tested - Configuration Documentation**

EUT Configuration																							
Work Order: J1068 Company: Novalab Company Address: 292 Still River Rd Still River, MA 01467 Contact: Scott Keller Person Present: Scott Keller																							
<table border="1"> <thead> <tr> <th>MN</th><th>PN</th><th>SN</th></tr> </thead> <tbody> <tr> <td>EUT: NL7352</td><td>--</td><td>1</td></tr> <tr> <td>EUT Description: MAD Sensor</td><td></td><td></td></tr> <tr> <td>EUT Max Frequency: 928 MHz</td><td></td><td></td></tr> </tbody> </table>						MN	PN	SN	EUT: NL7352	--	1	EUT Description: MAD Sensor			EUT Max Frequency: 928 MHz								
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Port Label	Port Type	No. of ports	No. Populated	Cable Type	Shielded	Ferrites	Length	Max Length	In/Out	NEBS Type	Unpopulated Reason												
<p><b>Software / Operating Mode Description:</b></p> <p>Wirelessly sending commands to EUT to have the EUT to transmit package on particular channel as fast as its can through its ten channels.</p>																							

## Statement of Conformity

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

Part 15	Comments																																			
15.15(b)	There are no controls accessible to the user that varies the output power.																																			
15.19	The label is shown in the label exhibit.																																			
15.21	Information to the user is shown in the instruction manual exhibit.																																			
15.27	No special accessories are required for compliance.																																			
15.31	The EUT was tested in accordance with the measurement standards in this section.																																			
15.33	Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates.																																			
15.35	The EUT emissions were measured using the measurement detector and bandwidth specified in this section, unless noted in specific rule section under which the equipment operates.																																			
15.203	The antenna for this device is hardwired to the PCB.																																			
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.																																			
15.247	To meet compliance to 15.247(e) the RF output power was reduced by 10dB. Prior to decreasing the output power, the unit failed: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Channel Frequency</th> <th>Ananlyzer Reading</th> <th>Attenuator Factor</th> <th>Final Measurement</th> <th>Limit</th> <th>Margin</th> <th>Result</th> </tr> <tr> <th>(MHz)</th> <th>(dBm)</th> <th>(dB)</th> <th>(dBm)</th> <th>(dBm)</th> <th>(dB)</th> <th>(Pass/Fail)</th> </tr> </thead> <tbody> <tr> <td>906.2</td> <td>-0.232</td> <td>19.4</td> <td>19.168</td> <td>8</td> <td>11.168</td> <td>Fail</td> </tr> <tr> <td>914.2</td> <td>0.137</td> <td>19.4</td> <td>19.537</td> <td>8</td> <td>11.537</td> <td>Fail</td> </tr> <tr> <td>924.2</td> <td>-0.438</td> <td>19.4</td> <td>18.962</td> <td>8</td> <td>10.962</td> <td>Fail</td> </tr> </tbody> </table>	Channel Frequency	Ananlyzer Reading	Attenuator Factor	Final Measurement	Limit	Margin	Result	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	(Pass/Fail)	906.2	-0.232	19.4	19.168	8	11.168	Fail	914.2	0.137	19.4	19.537	8	11.537	Fail	924.2	-0.438	19.4	18.962	8	10.962	Fail
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924.2	-0.438	19.4	18.962	8	10.962	Fail																														

## ***Test Results***

### ***Bandwidth***

#### **LIMIT**

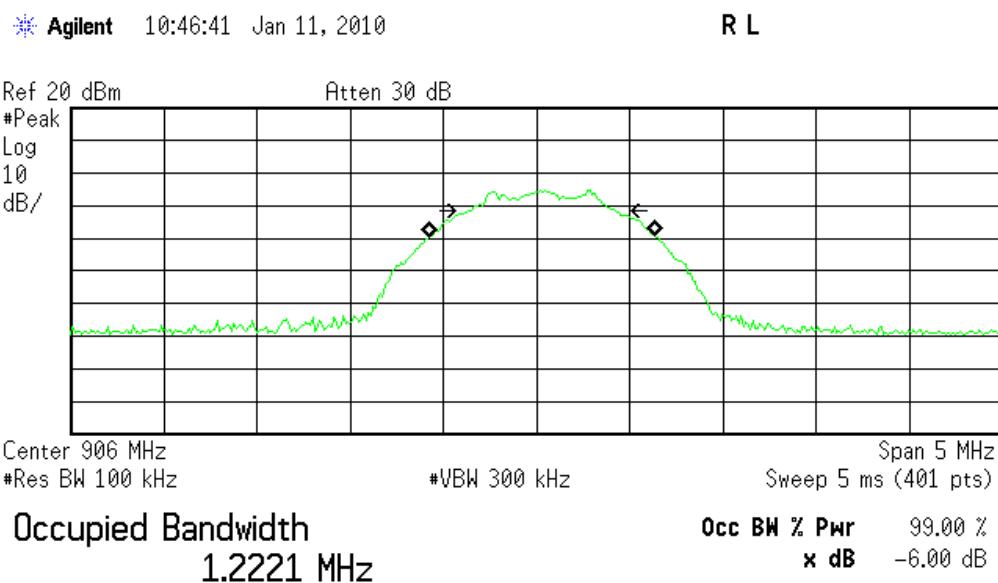
*The minimum 6 dB bandwidth shall be at least 500 kHz. [15.247(a) (2)]*

### **MEASUREMENTS / RESULTS**

Channel	Frequency (MHz)	6 dB Emission Bandwidth (KHz)
1	905.7	773.9
5	914.2	673.9
10	924	637.7

Test Equipments used: Brown Spectrum Analyzer  
20dB 50Watt Attenuator 23 deg celcius  
Tested by: Tuyen Truong 20% humidity  
Test Date: 1/11/2010 1009 mBar

### **Representative PLOT**



## Peak Power

### LIMIT

Conducted Output Power

1 Watt

[15.247(b) (3)]

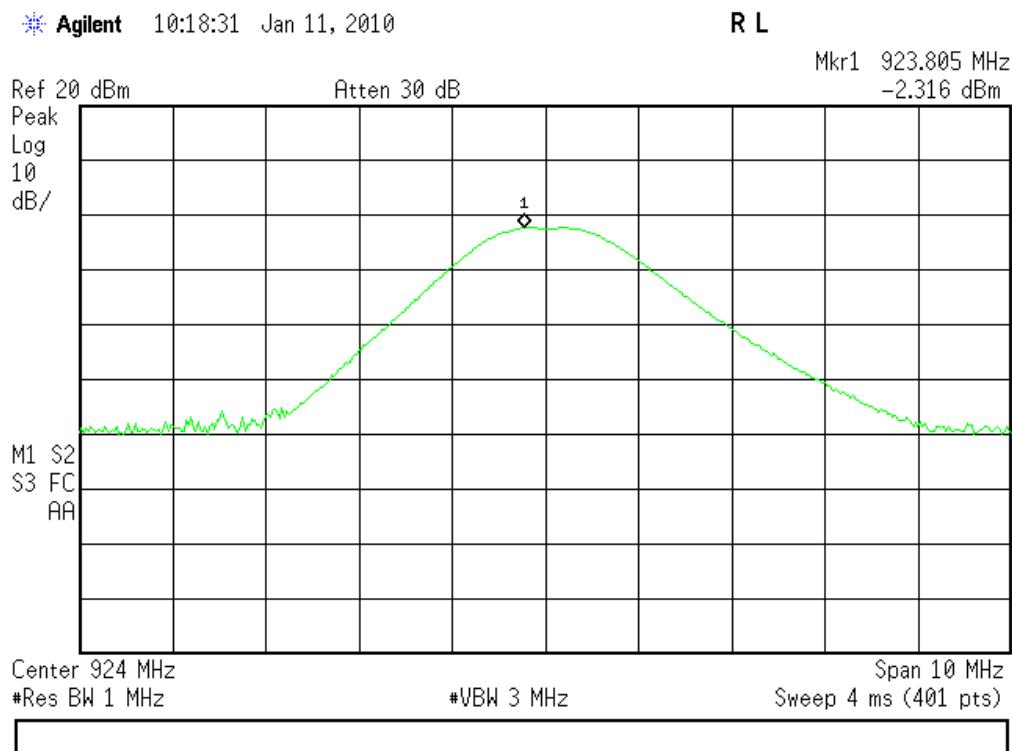
## MEASUREMENTS / RESULTS

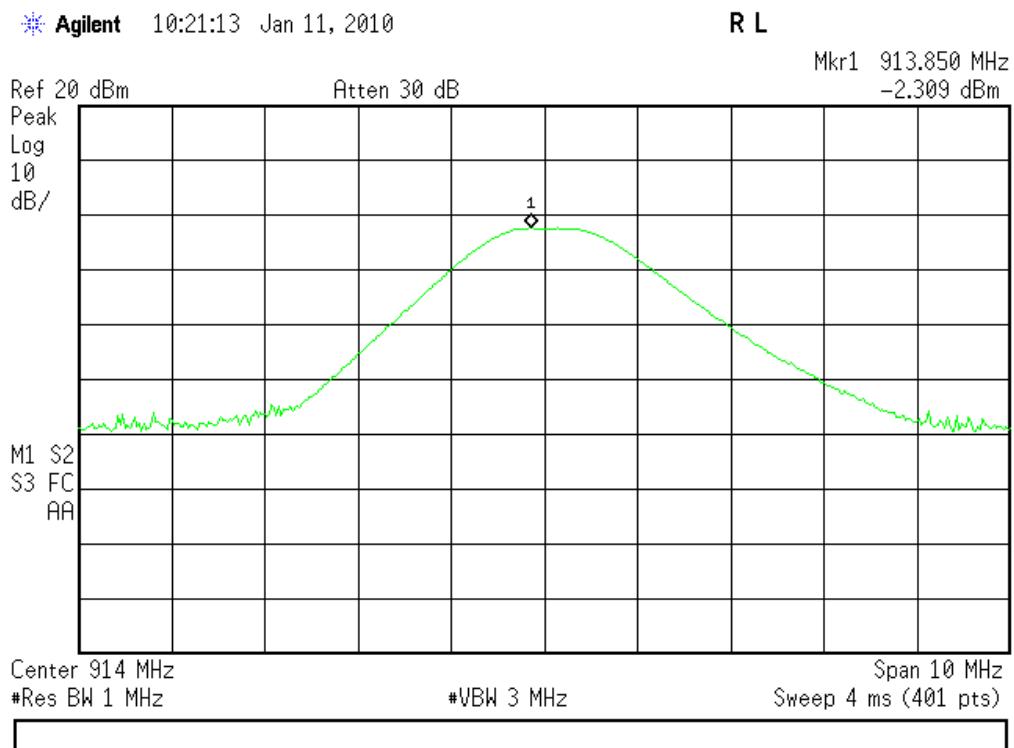
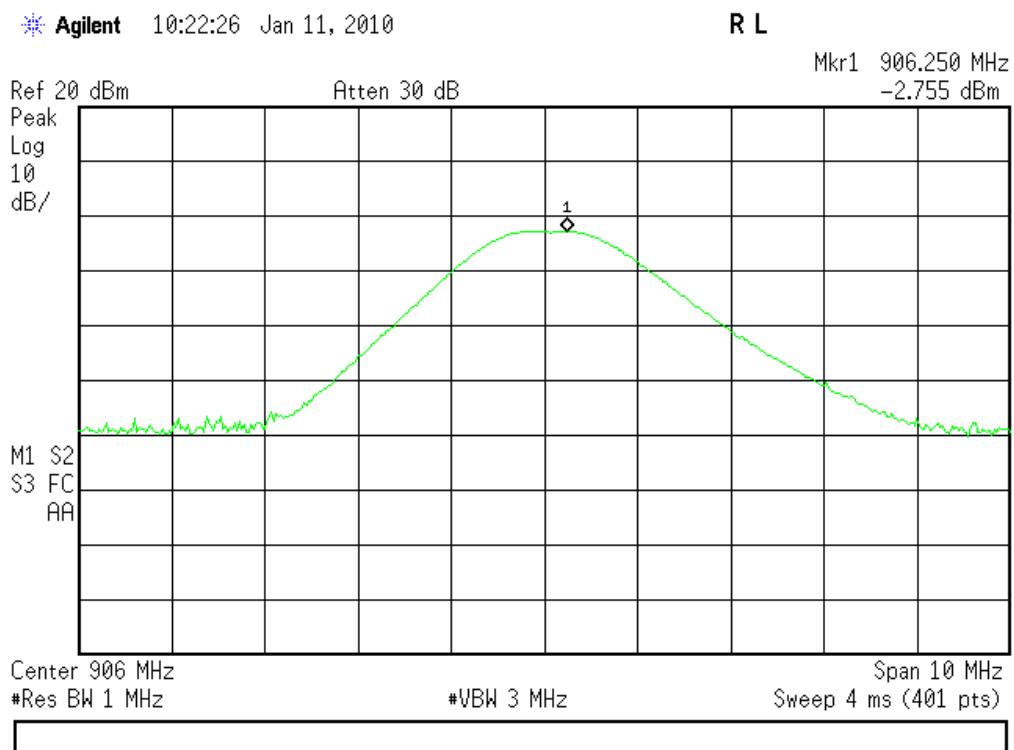
Channel Frequency	Analyzer Reading	Attenuator Factor	Final Measurement	Limit	Margin	Result
(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	(P/F)
906.20	-2.76	19.40	16.65	30.00	-13.36	Pass
914.20	-2.31	19.40	17.09	30.00	-12.91	Pass
923.80	-2.32	19.40	17.08	30.00	-12.92	Pass

Test Equipments used: Brown Spectrum Analyzer  
20dB 50Watt Attenuator  
Tested by: Tuyen Truong  
Test Date: 1/11/2010

## PLOTS

### Channel 10



**Channel 5****Channel 1**

## Band Edge Measurements

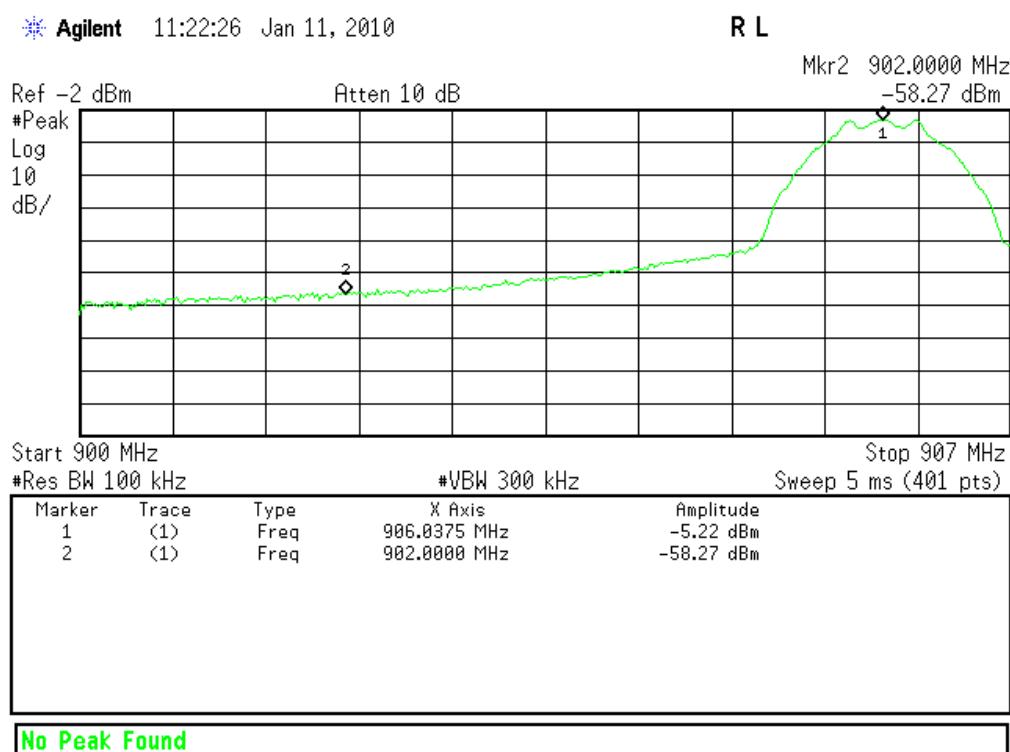
### LIMITS

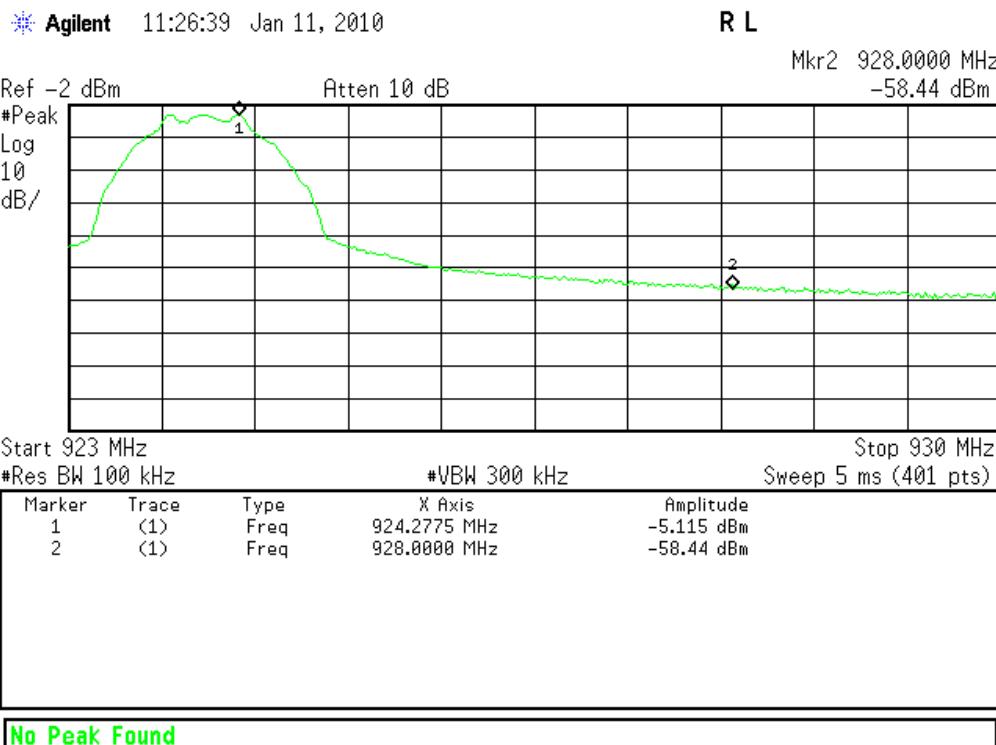
In any 100kHz bandwidth outside the frequency and in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits..

[15.247(d)]

### PLOTS

#### 902MHz Restricted Band



**928MHz Restricted Band**

## ***Duty Cycle Correction Calculation***

$$\text{DCCF} = 20 * \log (0.6\text{ms} / 100\text{ms}) = -44\text{dB}$$

A maximum allowance of 20dB was used for duty cycle correction factor.

## **RF Transmission Timing – NovaLab MAD System**

The NovaLab MAD system transmits when an “event” occurs. An event may be a periodic status message or it may be due to the detection of a magnetic anomaly or magnetic change. Both of these events are infrequent – the periodic status occurs approximately once per hour and the asynchronous detection message might occur 10 time per day on average.

When a transmission event occurs (whether a status message or a sensor message), the system will transmit a short packetized message (~600 usec transmission time) five (5) times on ten (10) channels (for a total of 50 transmissions). Each transmission is spaced at a random time interval with a minimum time of 100 msec and a maximum time of 200 msec – the average time between transmissions being 150 msec. Consequently, each transmitted event takes about 6 seconds to complete.

In any 100 msec period, there will be – at most – a single transmission. This transmission is less than 600 usec long making the maximum “on” duty-cycle 0.6msec/100msec or 0.006 (0.6%).

The channel frequencies are as follows:

Channel	MHz
1	906
2	908
3	910
4	912
5	914
6	916
7	918
8	920
9	922
10	924

## Radiated Spurious Emissions

### LIMITS

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).  
[15.247(d)]

### MEASUREMENTS / RESULTS

#### Radiated Emissions Table

Date: 11-Jan-10	Company: Novalab	Work Order: J1068								
Engineer: Tuyen Truong	EUT Desc: MAD Sensor	EUT Operating Voltage/Frequency: 3.6 Vdc								
Temp: 26°C	Humidity: 33%	Pressure: 1009 mBar								
Frequency Range: 30 to 1000 MHz		Measurement Distance: 3 m								
Notes: Tested Channel 1 and 10 of the EUT.		EUT Max Freq: 928 MHz								
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dB $\mu$ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dB $\mu$ V/m)	---	FCC Class B		
Test Site: EMI Chamber 1	Cable 1: Asset #1505	Cable 2: Asset #1507	Analyzer: Asset #1328	Preamp: none	Antenna: Red-Black	Limit (dB $\mu$ V/m)	Margin (dB)	Result (Pass/Fail)		
NO EMISSIONS FOUND WITHIN 20dB OF LIMIT										

#### Radiated Emissions Table

Date: 11-Jan-10	Company: Novalab	Work Order: J1068												
Engineer: Tuyen Truong	EUT Desc: MAD Sensor	EUT Operating Voltage/Frequency: 3.6 Vdc												
Temp: 26°C	Humidity: 33%	Pressure: 1009 mBar												
Frequency Range: 1 -10 GHz		Measurement Distance: 3 m												
Notes:		EUT Max Freq: 928 MHz												
Antenna Polarization (H / V)	Frequency (MHz)	Peak Reading (dB $\mu$ V)	Average Reading (dB $\mu$ V)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dB $\mu$ V/m)	Adjusted Avg Reading (dB $\mu$ V/m)	FCC Class B High Frequency - Peak			FCC Class B High Frequency - Average		
Test Site: EMI Chamber 1	Cable 1: Asset #1505	Cable 2: Asset #1507	Analyzer: Asset #1328	Preamp: none	Antenna: Orange Horn	Limit (dB $\mu$ V/m)	Margin (dB)	Result (Pass/Fail)	Limit (dB $\mu$ V/m)	Margin (dB)	Result (Pass/Fail)			
No Emissions Found, noise floor only														

## Conducted Spurious Emissions

### LIMITS

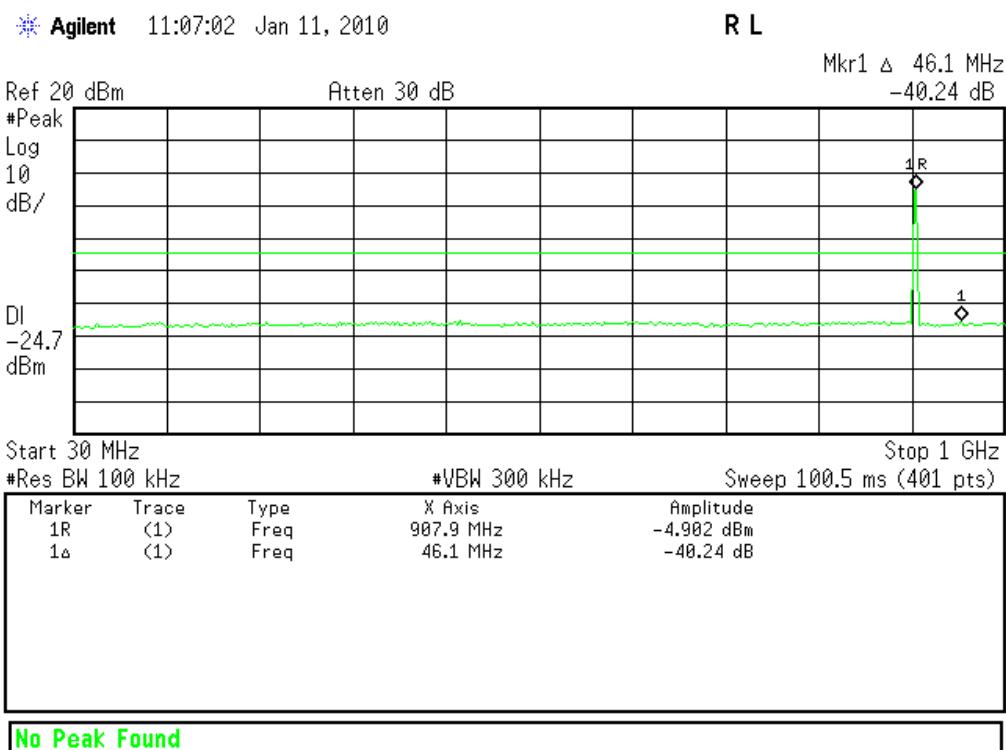
*In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth that contains the highest level of desired power...*

[15.247(d)]

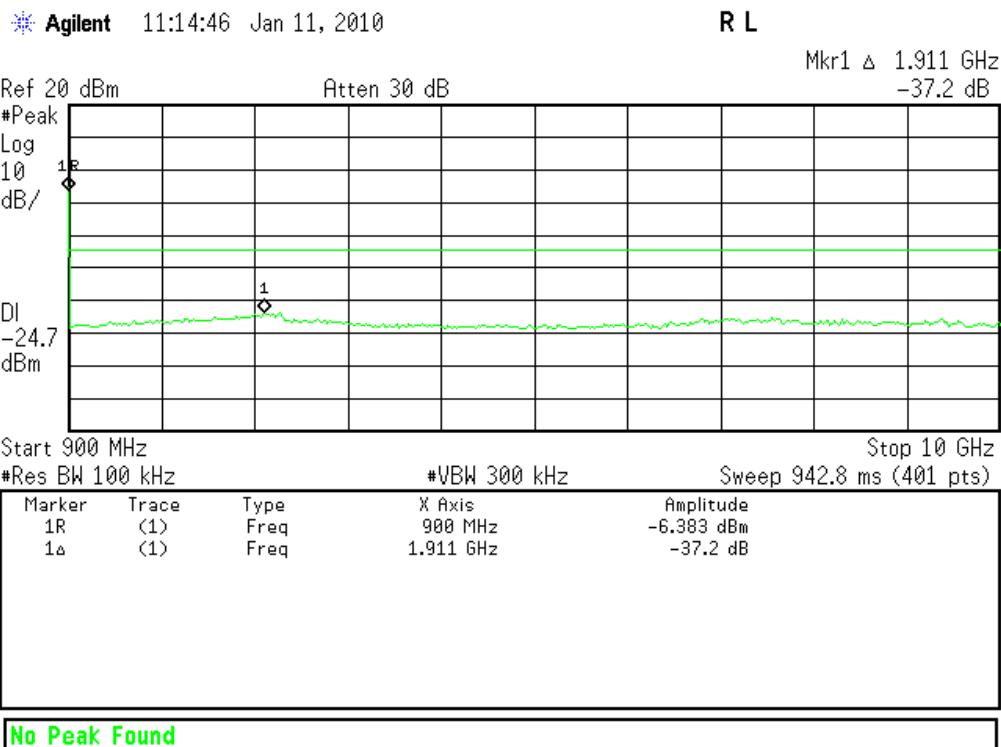
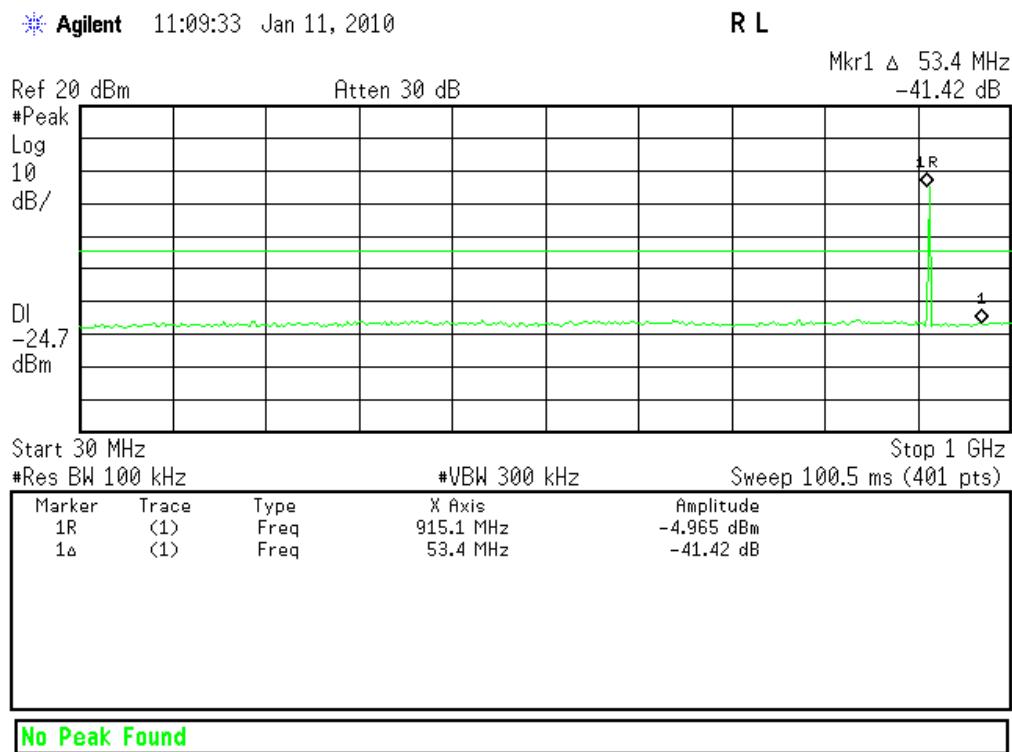
### MEASUREMENTS / RESULTS

#### Channel 1

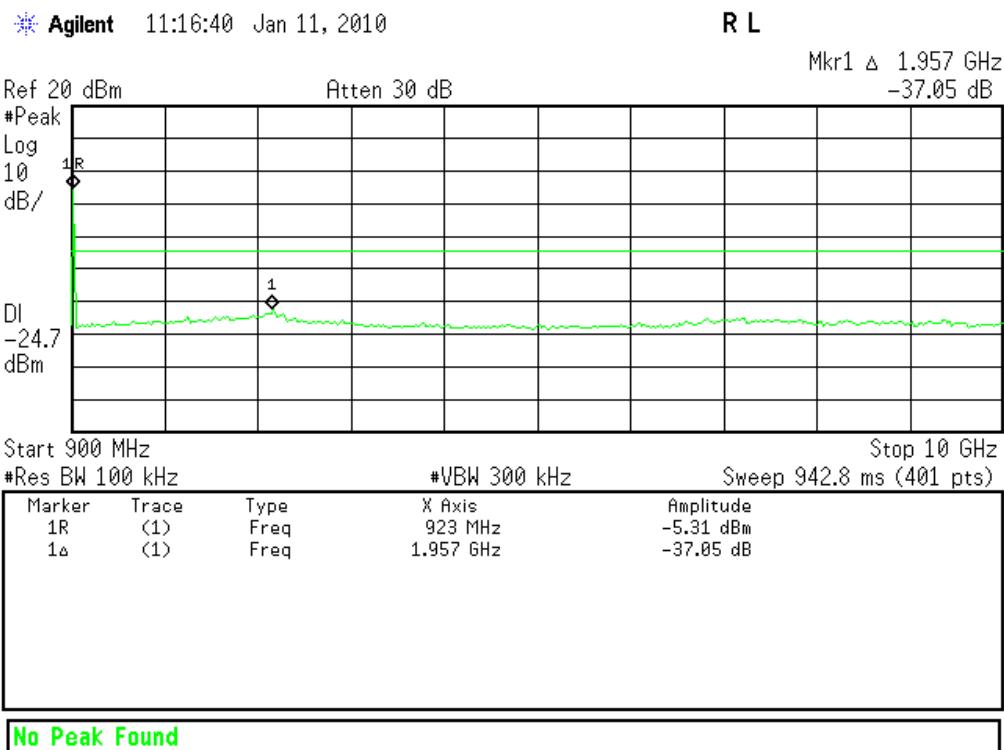
30-1000MHz



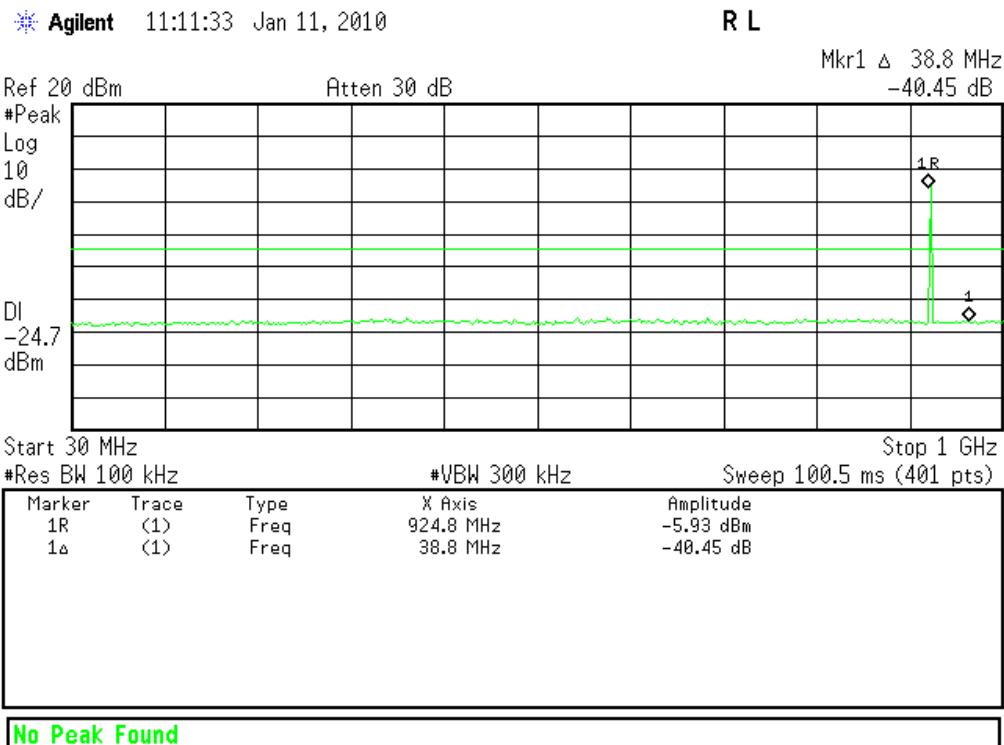
## 1-10GHz

Channel 5  
30-1000MHz

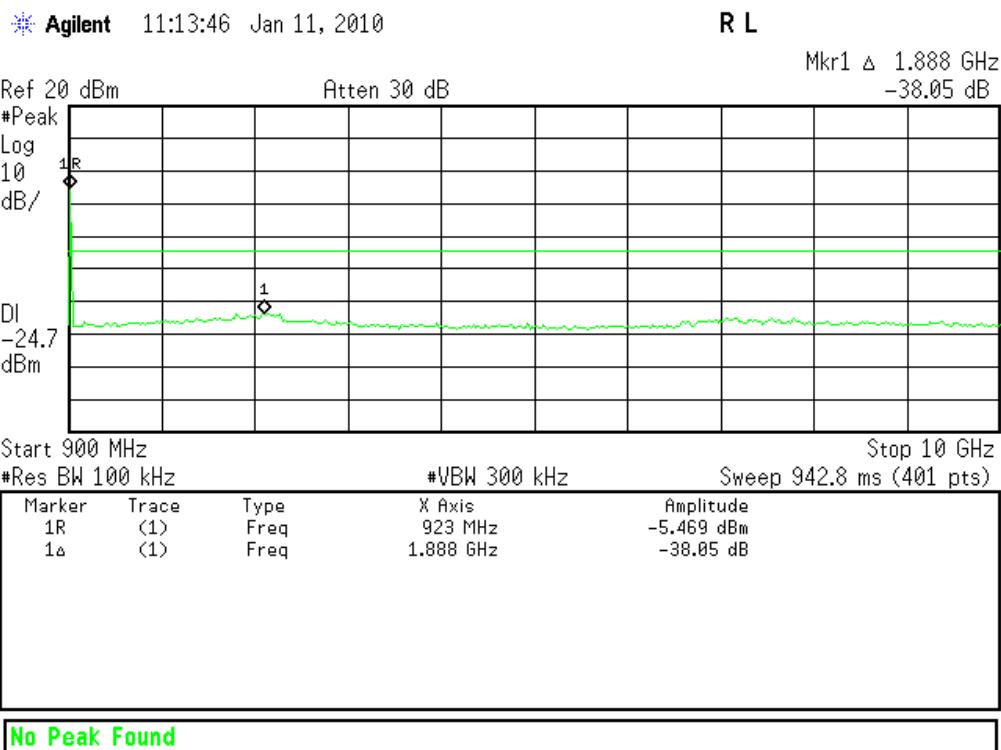
1-10GHz

**Channel 10**

30-1000MHz



1-10GHz



## Power Spectral Density

### LIMIT

...the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.  
[15.247(e)]

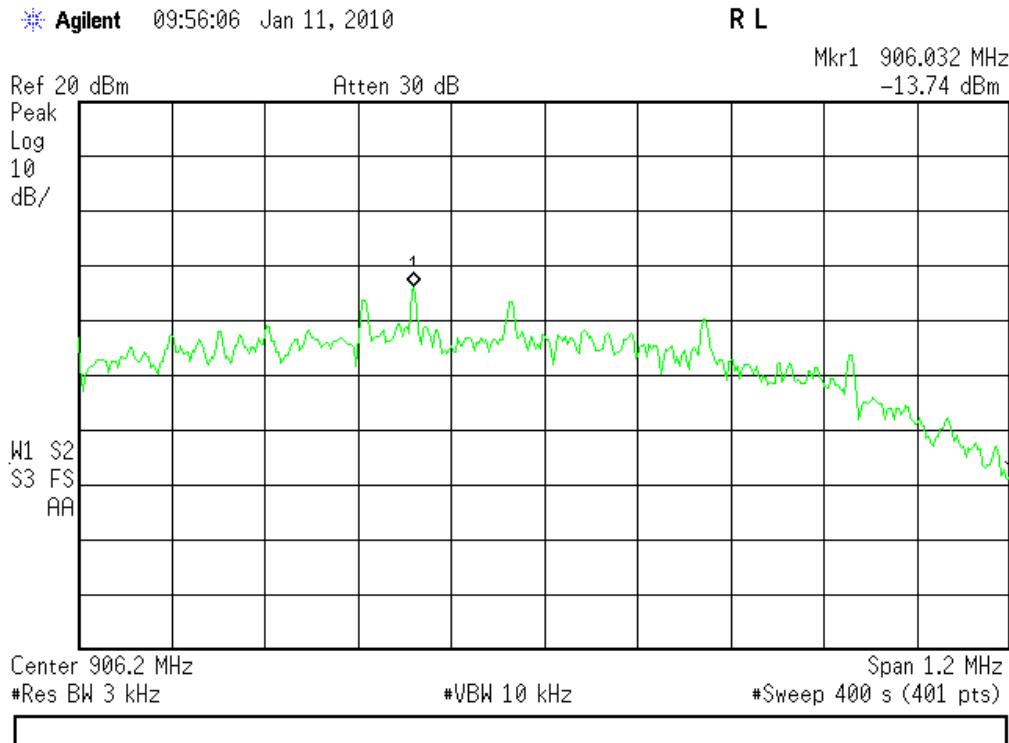
### MEASUREMENTS / RESULTS

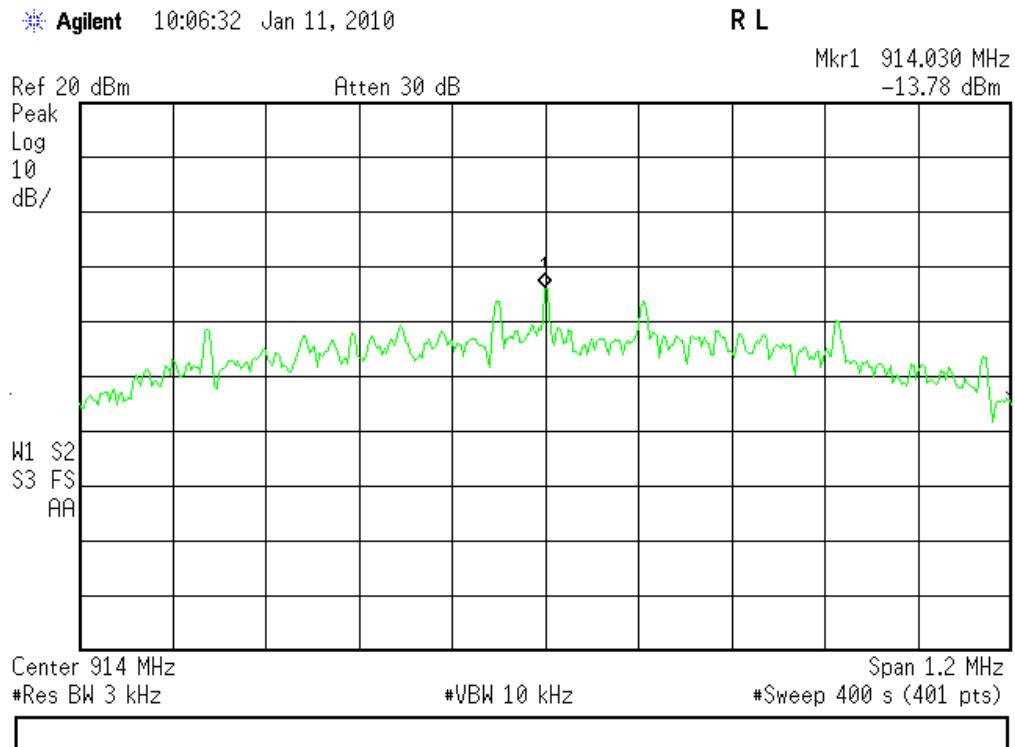
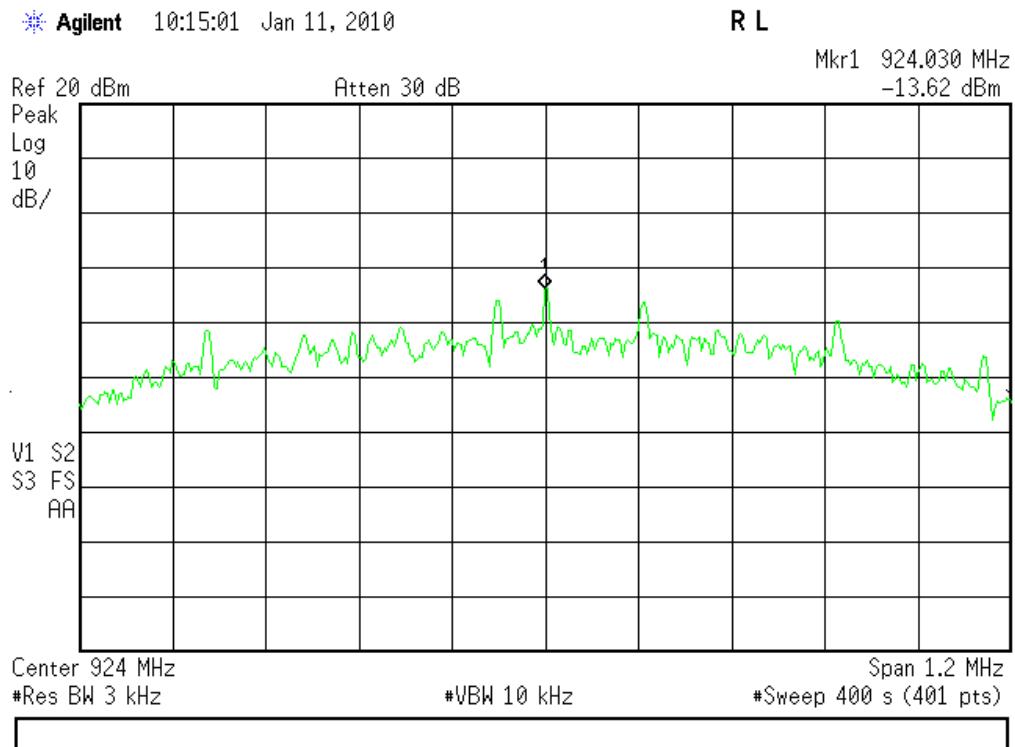
Channel Frequency	Ananlyzer Reading	Attenuator Factor	Final Measurement	Limit	Margin	Result
(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	(Pass/Fail)
906.2	-13.74	19.4	5.66	8	-2.34	Pass
914.0	-13.78	19.4	5.62	8	-2.38	Pass
924.0	-13.62	19.4	5.78	8	-2.22	Pass

Test Equipments used: Brown Spectrum Analyz  
20dB 50Watt Attenuator  
Tested by: Tuyen Truong  
Test Date: 1/11/2010

### PLOTS

#### Channel 1



**Channel 5****Channel 10**

## ***AC Line Conducted Emissions***

### **LIMITS**

Frequency of emission (MHz)	Quasi-peak limit (dB $\mu$ V)	Average limit (dB $\mu$ 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 / RESULTS**

Not applicable, EUT is Battery powered.

## ***Voltage Variations***

### **REQUIREMENT**

*Measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery powered equipment, the equipment tests shall be performed using a new battery.*

[15.31(e)]

### **MEASUREMENTS / RESULTS**

Not applicable, EUT is battery powered.

## Test Equipment Used

Rev: 25-Jan-2010

Spectrum Analyzers / Receivers /Preselectors		Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Gold SA EMI Chamber (1328) Rental SA #1 (Brown)	100Hz-26.5 GHz	E4407B	Agilent	MY45113816	1284	I		14-Aug-2010
	9kHz-13.2 GHz	E4405B	Agilent	MY44210241	1328	I		16-Dec-2010
	9kHz-26.5GHz	E4407B	Agilent	SG44210511	1510	I		10-Feb-2010
Radiated Emissions Sites	FCC Code	IC Code	VCCI Code			Cat	Calibration Due	
EMI Chamber 1	719150	2762A-6	R-3032, G-106			I		15-Feb-2011
Preamps /Couplers Attenuators / Filters	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	
HF 20dB 50W Attenuator	0.009-18 GHz	PE 7019-20	Pasternack	1	791	II		8-May-2011
HF 30dB 50W Attenuator	0.009-18 GHz	PE 7019-30	Pasternack	2	1168	II		8-May-2011
HF 40dB 50W Attenuator	0.009-18 GHz	PE 7017-40	Pasternack	NA	1513	II		8-May-2011
Antennas	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	
Red-Black BiLog	30-2000MHz	JB1	Sunol	A091604-2	1106	I		28-Oct-2010
Orange Horn	1-18GHz	3115	EMCO	0004-6123	390	I		19-Jun-2011
Meteorological Meters	MN	Mfr	SN	Asset	Cat	Calibration Due		
Temp./Humidity/Atm. Pressure Gauge	7400 Perception II	Davis	N/A	965	I			6-Apr-2011
CHAMBER1 Thermohygrometer	35519-044	Control Company	72457642	1345	II			18-Aug-2011
CEMI1 Thermohygrometer	35519-044	Control Company	72457738	1335	II			18-Aug-2011

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

***Product Documentation***

The following documentation has been provided by the client for inclusion in this report.

## Conditions Of Testing

[Bureau Veritas Consumer Products Services, Inc., a Massachusetts corporation], and/or its affiliates (collectively, the "Company") will conduct, at the request of the Submitter ("Client"), the tests specified on the submitted Test Request Form or equivalent in accordance with, and subject to, the following terms and conditions (collectively, "Conditions"):

1. All orders for tests are subject to acceptance by the Company, and no order will constitute a binding commitment of the Company unless and until such order is accepted by it, as evidenced by the issuance of a written report ("Test Report") by the Company. The Test Report is issued solely by the Company, is intended for the exclusive use of Client and shall not be published, used for advertising purposes, copied or replicated for distribution to any other person or entity or otherwise publicly disclosed without the prior written consent of the Company. By submitting a request for services to the Company, Client consents to the disclosure to accreditation bodies of those records of Client relevant to the accreditation body's assessment of the Company's competence and compliance with relevant accreditation criteria. The Company shall not be liable for any loss or damage whatsoever resulting from the failure of the Company to provide its services within any time period for completion estimated by the Company. If Client anticipates using the Test Report in any legal proceeding, arbitration, dispute resolution forum or other proceeding, it shall so notify the Company prior to submitting the Test Report in such proceeding. The Company has no obligation to provide a fact or expert witness at such proceeding unless the Company agrees in advance to do so for a separate and additional fee.
2. The Test Report will set forth the findings of the Company solely with respect to the test samples identified therein. Unless specifically and expressly indicated in the Test Report, the results set forth in such Test Report are not intended to be indicative or representative of the quality or characteristics of the lot from which a test sample is taken, and Client shall not rely upon the Test Report as being so indicative or representative of the lot or of the tested product in general. The Test Report will reflect the findings of the Company at the time of testing only, and the Company shall have no obligation to update the Test Report after its issuance. The Test Report will set forth the results of the tests performed by the Company based upon the written information provided to the Company. The Test Report will be based solely on the samples and written information submitted to the Company by Client, and the Company shall not be obligated to conduct any independent investigation or inquiry with respect thereto.
3. The Company may, in its sole discretion, destroy samples which have been furnished to the Company for testing and which have not been destroyed in the course of testing. The Company may delegate the performance of all or a portion of the services contemplated hereunder to an affiliate, agent or subcontractor of the Company, and Client consents to such delegation.
4. These Conditions and the Test Report represent the entire understanding of the parties hereto with respect to the subject matter hereof and of the Test Report, and no modification, variance or extrapolation with respect thereto shall be permitted without the prior written consent of the Company.
5. The names, service marks, trademarks and copyrights of the Company and its affiliates, including the names "**BUREAU VERITAS**," "**BUREAU VERITAS CONSUMER PRODUCTS SERVICES**," "**BVCPS**," "**MTL**," "**ACTS**," "**MTL-ACTS**" and **CURTIS-STRAUS** (collectively, the "Marks") are and shall remain the sole property of the Company or its affiliates and shall not be used by Client except solely to the extent that Client obtains the prior written approval of the Company and then only in the manner prescribed by the Company. Client shall not contest the validity of the Marks or take any action that might impair the value or goodwill associated with the Marks or the image or reputation of the Company or its affiliates.
6. Payment in full shall be due 30 days after the date of invoice. Interest shall be due on overdue amounts from the due date until paid at an interest rate of 1.5% per month or, if less, the maximum rate permitted by law. The Company reserves the right, at any time and from time to time, to revoke any credit extended to Client. Client shall reimburse the Company for any costs it incurs in collecting past due amounts, including court costs and fees and expenses of attorneys and collection agencies. The Test Report may not be used or relied upon by Client if and for so long as Client fails to pay when due any invoice issued by the Company or any affiliate of it to Client or any affiliate or subsidiary of Client together with interest and penalties, if any, accrued thereon.
7. The Company disclaims any and all responsibility or liability arising out of or in connection with e-mail transmissions of such information.
8. Client understands and agrees that the Company is neither an insurer nor a guarantor, that the Company does not take the place of Client or any designer, manufacturer, agent, buyer, distributor or transportation or shipping company, and that the Company disclaims all liability in such capacities. Client further understands that if it seeks assurance against loss or damage, it should obtain appropriate insurance.
9. Client agrees that the Company, by providing the services, does not take the place of Client nor any third party, nor does the Company release them from any of their obligations, nor does the Company otherwise assume, abridge, abrogate or undertake to discharge any duty of any third party to Client or any duty of Client or any third party to any other third party, and Client will not release any third party from its obligations and duties with respect to the tested goods.
10. Client shall, on a timely basis, (a) provide adequate instructions to the Company in order to enable the Company to perform properly its services, (b) provide, or cause Client's suppliers and contractors to provide, the Company with all documents necessary to enable the Company to perform its services, (c) furnish the Company with all relevant information regarding Client's intended use and purposes of the tested goods, (d) advise the Company of essential dates and deadlines relevant to the tested goods and (e) fully exercise all rights and remedies available to Client against third parties in respect of the tested goods.
11. The Company shall undertake due care and ordinary skill in the performance of its services to Client, and the Company shall accept responsibility only were such skill has not been exercised and, even in such event, only to the extent of the limitation of liability set forth herein.
12. If Client desires to assert a claim arising from or relating to (i) the performance, purported performance or non-performance of any services by the Company or (ii) the sale, resale, manufacture, distribution or use of any tested goods, it must submit that claim to the Company in a writing that sets forth with particularity the basis for such claim within 60 days from discovery of the potential claim and not more than six months after the date of issuance of the Test Report to Client. Client waives any and all such claims including, without limitation, claims that the Test Report is inaccurate, incomplete or misleading or that additional or different testing is required, unless and then only to the extent that Client submits a written claim to the Company within both such time periods.
13. CLIENT SHALL, EXCEPT TO THE EXTENT OF COMPANY'S LIABILITY TO CLIENT HEREUNDER (WHICH IN NO EVENT SHALL EXCEED THE LIMITATION OF LIABILITY HEREIN), HOLD HARMLESS AND INDEMNIFY THE COMPANY, ITS

AFFILIATES AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND SUBCONTRACTORS AGAINST ALL ACTUAL OR ALLEGED THIRD PARTY CLAIMS FOR LOSS, DAMAGE OR EXPENSE OF WHATSOEVER NATURE AND HOWSOEVER ARISING FROM OR RELATING TO (i) THE PERFORMANCE, PURPORTED PERFORMANCE OR NON-PERFORMANCE OF ANY SERVICES BY THE COMPANY OR (ii) THE SALE, RESALE, MANUFACTURE, DISTRIBUTION OR USE OF ANY TESTED GOODS.

14. EXCEPT AS MAY OTHERWISE BE EXPRESSLY AGREED TO IN WRITING BY THE COMPANY AND NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN OR IN ANY TEST REPORT, NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, IS MADE.

15. (A) IN NO EVENT WHATSOEVER SHALL THE COMPANY BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL, EXEMPLARY OR PUNITIVE DAMAGES IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE TEST REPORT OR THE SERVICES PROVIDED BY THE COMPANY HEREUNDER, INCLUDING WITHOUT LIMITATION LOSS OF OR DAMAGE TO PROPERTY; LOSS OF INCOME, PROFIT OR USE; OR ANY CLAIMS OR DEMANDS MADE AGAINST CLIENT OR ANY OTHER PERSON BY ANY THIRD PARTY IN CONNECTION WITH, RELATING TO OR ARISING OUT OF THE SERVICES PROVIDED BY THE COMPANY HEREUNDER.

(B)NOTWITHSTANDING ANY PROVISION TO THE CONTRARY CONTAINED HEREIN, AND IN RECOGNITION OF THE RELATIVE RISKS AND BENEFITS TO CLIENT AND THE COMPANY ASSOCIATED WITH THE TESTING SERVICES CONTEMPLATED HEREBY, THE RISKS HAVE BEEN ALLOCATED SUCH THAT UNDER NO CIRCUMSTANCES WHATSOEVER SHALL THE LIABILITY OF THE COMPANY TO CLIENT OR ANY THIRD PARTY IN RESPECT OF ANY CLAIM FOR LOSS, DAMAGE OR EXPENSE, OF WHATSOEVER NATURE OR MAGNITUDE, AND HOWSOEVER ARISING, EXCEED AN AMOUNT EQUAL TO FIVE (5) TIMES THE AMOUNT OF THE FEES PAID TO THE COMPANY FOR THE SPECIFIC SERVICES WHICH GAVE RISE TO SUCH CLAIM OR U.S.\$10,000, WHICHEVER IS THE LESSER AMOUNT.

16. The Company shall not be liable for any loss or damage resulting from any delay or failure in performance of its obligations hereunder resulting directly or indirectly from any event of force majeure or any event outside the control of the Company. If any such event occurs, the Company may immediately cancel or suspend its performance hereunder without incurring any liability whatsoever to Client.

17. Company's services, including these Conditions, shall be governed by, and construed in accordance with, the local laws of the country where the Company performs the tests or, in the case of tests performed in the United States of America, the laws of Massachusetts without regard to conflicts of laws principles. If any aspect(s) of these Conditions is found to be illegal or unenforceable, the validity, legality and enforceability of all remaining aspects of these Conditions shall not in any way be affected or impaired thereby. Any proceeding related to the subject matter hereof shall be brought, if at all, in the courts of the country where the Company performs the tests or, in the case of tests performed in the United States of America, in the courts of Massachusetts. Client waives the right to interpose any counterclaim or setoffs of any nature in any litigation arising hereunder.

Rev.160009121(2) #684340 v13CS

## A2LA Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999			
CURTIS-STRaus <sup>1</sup> 527 Great Road Littleton, MA 01460 Barry Quinlan Phone: 978-486-8880 ELECTRICAL			
Valid until: July 31, 2007	Certificate Number: 1627.01		
In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following Electromagnetic Compatibility (EMC), Telecommunications, and Product Safety tests:			
<b>Electromagnetic Compatibility (EMC)</b> Radiated emissions testing (electric and magnetic fields)*; Conducted emissions testing (voltage and current)*; Electrostatic Discharge testing*; Electrical Fast Transient testing*; Radiated Immunity testing*; Conducted Immunity testing*; Lightning Immunity testing*; Voltage Dips*, Interrupts and Voltage Variations testing*; Magnetic Immunity testing*; RF Power measurements*; Frequency Stability Measurements*; Longitudinal Induction measurements*; Harmonic emissions testing*; Light flicker testing*; Low frequency disturbance voltage testing*; Disturbance Power measurements*; Power Cross Overvoltage testing*;			
<b>Test Type</b>	<b>Test Method(s)</b>		
<b>Emissions</b>			
Radiated and Conducted Emissions	FCC 47 CFR Part 15, 18; CISPR 22; CISPR 22; SABS CISPR 22; AS/NZS CISPR 22; AS/NZS 3548; Canada ICES-003; CNS13438; KN 22 (RRL No. 2005-82, September 29, 2005); CISPR 11; EN 55011; SABS CISPR 11; AS/NZS CISPR 11; AS/NZS 2064; Canada ICES-001; CNS13803; CISPR 13; EN 55013; SABS CISPR 13; AS/NZS CISPR 13; AS/NZS 1053; CISPR 14-1; EN 55014-1; SABS CISPR 14; AS/NZS CISPR 14; AS/NZS 1044; CNS 13439; CISPR 15; EN 55015; GR-1089-CORE; CNS C108.8-M1983;		
Harmonics	EN 61000-3-2; AS/NZS 61000.3.2		
Flicker	EN 61000-3-3; AS/NZS 61000.3.3		
1 Note: This accreditation covers testing performed at the laboratory listed above and the satellite facility located at 168 Ayer Rd, Littleton, MA 01460 and, for test types marked with an asterisk, at other sites as defined in "A2LA specific criteria for the accreditation of site testing and site calibration laboratories."			
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<b>Other Radio Standards</b>	RTTE 01 (DGT-Taiwan);		
<b>FCC Standards and Test methods Support TCB Status--</b>			
<b>FCC Scope A – Unlicensed Radio Frequency Devices</b>			
A1	1. 47 CFR Part 11, 15 and 18 2. FCC MP-5, 3. ANSI C63.4-2003,		
A2	1. 47 CFR Part 15, 2. ANSI C63.4-2003,		
A3	1. 47 CFR Part 15, 2. ANSI C63.17-1998, 3. ANSI C63.4-2003,		
A4	1. 47 CFR Part 15, 2. ANSI C63.4-2003,		
<b>FCC Scope B – Licensed Radio Service Equipment</b>			
B1	1. 47 CFR Parts 2, 22, 24, 25, and 27 2. ANSI/TIA-603-C (2004)		
B2	1. 47 CFR Parts 2, 22, 74, 90, 95, and 97 2. ANSI/TIA-603-C (2004)		
B3	1. 47 CFR Parts 2, 80, and 87 2. ANSI/TIA-603-C (2004)		
B4	1. 47 CFR Parts 2, 21, 74, and 101 2. ANSI/TIA-603-C (2004)		
<b>Country Specific Standards and Other</b>			
<b>ITU EMC Standards</b>	K.20; K.21; K.41; K.44		
<b>Swedish EMC Standards</b>	BAKOM 3336.3		
<b>South African EMC Standards other then CISPR equivalents</b>	SABS 1718-1; SANS 211/SABS CISPR 11; SANS 224/SABS CISPR 24; SANS 213/SABS CISPR 13; SANS 2200; SANS214-1/SABS CISPR 14-1; SANS214-2/SABS CISPR 14-2; SANS 215/SABS CISPR 15; SANS 222/SABS CISPR 22		
<b>Hong Kong EMC Standards</b>	HKTA 1006; HKTA 1007; HKTA 1008; HKTA 1010; HKTA 1015; HKTA 1026; HKTA 1035; HKTA 1039; HKTA 1041; HKTA 1042; HKTA 1045		
<b>Singapore EMC Standards</b>	IDA TS SRD; IDA TS EMC		
<b>Japanese VCCI Standards</b>	VCCI V-3, VCCI V-4		
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<b>Immunity</b>	RRL No. 2005-130 (December 27, 2005)		
Electrostatic Discharge (ESD)	EN 61000-4-2; AS/NZS 61000.4.2; KN61000-4-2		
Radiated Immunity (RFI)	EN 61000-4-3; AS/NZS 61000.4.3; KN61000-4-3		
Electrical Fast Transient Bursts (EFT)	EN 61000-4-4; AS/NZS 61000.4.4; KN61000-4-4		
Surge	EN 61000-4-5; AS/NZS 61000.4.5; KN61000-4-5		
Conducted Immunity	EN 61000-4-6; AS/NZS 61000.4.6; KN61000-4-6		
Magnetic Immunity	EN 61000-4-8; AS/NZS 61000.4.8; KN61000-4-8		
Voltage Dips and Interrupts	EN 61000-4-11; KN61000-4-11		
Low Frequency Conducted Disturbances	EN 61000-2-2		
<b>Family Product or Industry Specific Specifications including emissions and/or immunity</b>	GR-1089-CORE; GR-78-CORE (ESD) EN50081-1; EN50081-2; EN50082-2; EN50082-1; EN 61000-6-1; EN 61000-6-2; EN 61000-6-3; EN 61000-6-4; EN 50091-2; EN 55024; CISPR 24 EN 55103-1; EN 55103-2; EN 61326; EN 61547; EN 50130-4; EN 50083-2; EN 60601-1-2; EN 60601-2-2; EN 60601-2-4; EN 60601-2-32; EN 60601-2-38; EN 60601-2-47; IEC 1800-3; EN 61800-3; EN 55020; CISPR 20; EN 60555 Part 2; EN 60555 Part 3; ETS 300 386-1; EN 300 386-2; EN 300 386; ETS 300 132-1; ETS 300 132-2; EN 60669-2-1; AS/NZS 3200.1.2; CNS 13783-1; ETR 283; C62.41		
<b>Radiocommunications</b>			
<b>EU R&amp;TTE Radio Standards;</b>	EN 300 220-1; EN 300 220-3; EN 300 330-1; EN 300 330-2; EN 300 440-1; EN 300 440-2; EN 300 328; EN 300 385; EN 301 893		
<b>EUR &amp; TTE EMC Standards</b>	EN 301 339; EN 301 489-01; EN 301 489-03; EN 301 489-17		
<b>Canada Radio Standards</b>	RSS-102; RSS-117; RSS-118; RSS-119; RSS-123; RSS-125; RSS-128; RSS-129; RSS-130; RSS-131; RSS-132; RSS-133; RSS-134; RSS-135; RSS-136; RSS-137; RSS-138; RSS-141; RSS-142; RSS-170; RSS-181; RSS-182; RSS-187; RSS-188; RSS-191; RSS-192; RSS-193; RSS-195; RSS-210; RSS-212; RSS-213; RSS-215; RSS-243; RSS-GEN; RSS-310; GL-36		
<b>Australia/New Zealand Radio Standards</b>	AS/NZS 4268; AS/NZS 4771; RFS29; Radiocommunications (Data Transmission Equipment Using Spread Spectrum Modulation Techniques); Radiocommunications (Spread Spectrum Devices); Radiocommunications (Short Range Devices); Radiocommunications (Low Interference Potential Devices);		

Telecom Standards	<p><b>Title</b></p> <p>Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 1544 kbit/s</p> <p>Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 2048 kbit/s</p> <p>Network Connection Specification for Connection of Customer Premises Equipment (CPE) to the Public Telecommunications Network (PTN) in Hong Kong using Digital Leased Circuits at nx64 kbit/s</p> <p>Network Connection Specification for Connection of Customer Premises Equipment (CPE) to the Public Telecommunications Networks in Hong Kong using Asymmetric Digital Subscriber Lines (ADSL) based on ITU-T Recommendation G.992.1</p> <p>Network Connection Specification for Connection of Customer Premises Equipment (CPE) to Fixed Telecommunications Networks in Hong Kong using Splitterless Asymmetric Digital Subscriber Lines (ADSL) based on ITU-T Recommendation G.992.2</p>	European standards (cont'd)	TBR 21: 1998	<p>Terminal Equipment (TE); Attachment requirements For pan-European approval for connection to the Analogue Public Switched Telephone Networks (PSTNs) of TE (excluding TE supporting the voice telephony service) in which network addressing, if provided, is by means of Dual Tone Multi Frequency (DTMF) signaling</p> <p>Business TeleCommunications (BTC); 34 Mbit/s Digital Unstructured and structured leased lines (D34U and D34S); Attachment requirements for Terminal equipment interface</p>
HKTA 2028		TBR 24: 1997		
HKTA 2029		Taiwan standards (DGT)	ADSL01	
HKTA 2030		ID0002		
HKTA 2031		IS6100		
HKTA 2032		PSTN01 (non-voice only)		
HKTA 2033		New Zealand standards	PTC 200 (non-voice only)	
European standards		PTC 217		
TBR 1: 1995		TNA 117		
TBR 2: 1997		PTC 270		
TBR 3: 1995 + Amdt : 1997		Singapore Standards	IDA TS ADSL	
TBR 4: 1995 + Amdt : 1997		IDA TS ADSL 2		
TBR 012: 1993 + Amdt : 1996		IDA TS DLCN 1		
TBR 013: 1996		IDA TS ISDN 1		
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		IDA TS PSTN (non-voice only)		
TBR 013: 1996		South Africa standards	TE-001 (non-voice only)	

<i>Environmental Simulation</i>		
Test Technology	Test Standard	Supporting Standards
Accessibility*	IEC 60529	IP-0x thru IP-6x
Acoustic Noise*	GR-63-CORE Sec 4.6	
Airborne Contaminants	GR-63-CORE Sec 4.5	MFG & Hygroscopic Dust
Altitude	GR-63-CORE Sec 4.1.3	
Cold Start*	ETS 300 019	IEC 60068-2-1
Drip	IEC 60529	IP-x1 & IP-x2
Drops*	ETS 300 019	IEC 60068-2-32
Dust	GR-63-CORE Sec 4.3	IP-5x & IP-6x
Firearms Resistance Testing	IEC 60529	
Fire Resistance	GR-487	
	ANSI/T1.319	
Heat Dissipation*	GR-63-CORE Sec 4.2	Fire & Needle Flame
Illumination	GR-63-CORE Sec 4.1.4	
Operational Temperature & Humidity (OpTH)*	GR-63-CORE Sec 4.7	
	ETS 300 019	IEC 60068-2-1
		IEC 60068-2-2
		IEC 60068-2-14
		IEC 60068-2-56
Salt Fog & Spray	ASTM B117	
Spatial*	GR-63-CORE Sec 2.0 & 3.0	
Spraying-Splashing	IEC 60529	IP-x3 & IP-x4
Storage (Temperature & Humidity)*	ETS 300 019	IEC 60068-2-1
		IEC 60068-2-2
		IEC 60068-2-14
		IEC 60068-2-30
		IEC 60068-2-56
Vibration	GR-63-CORE Sec 4.1.1	
	ETS 300 019	IEC 60068-2-6
		IEC 60068-2-27
		IEC 60068-2-29
		IEC 60068-2-32
		IEC 60068-2-57
		IEC 60068-2-64
		Earthquake, Office & Transportation
Water Immersion	GR-63-CORE Sec 4.4	
Water Jet	IEC 60529	IP-x7 & IP-x8
	IEC 60529	IP-x5 & IP-x6

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Note 1. For standards or methods listed on the scope of accreditation without a revision date, laboratories are expected to be competent in the use of the current version within one year of the date of publication of the standard test method or upon the date specified by the standard test method originator when the originator has implementation authority. When a superseded standard or method is required for an accredited test, the scope will include the superseded date/version. For those that support the TCB/CB status of the organization acting as a certifier on behalf of the FCC or IC the expectation is currency within 30 days of Federal Register publication of changes for FCC and 30 days after IC website update. This note shall not be construed as an Accreditation Body implication to adopt a more current standard than is required in a regulation or code (i.e. the legal requirement) which is adopted by the lab under their responsibility.

\* On-site test service is available for this technology, test, or method.

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