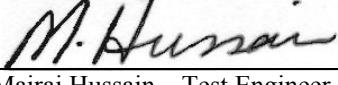




# Test Report

|                     |   |
|---------------------|---|
| Report No           | EE0977-1  |
| Client              | Sensicast Systems   |
| Phone               | 781-453-2555  |
| Fax                 | 781-453-0601  |
| Models              |   |
| FCC ID              | RNB-OEM100  |
| FRN                 | 0009860149  |
| Equipment Type      | Low Power Communication Device Transmitter  |
| Equipment Code      | DSS   |
| Results             | As detailed within this report  |
| Prepared by         | <br>Mairaj Hussain – Test Engineer |
| Authorized by       | <br>Michael Buchholz – EMC Manager |
| Issue Date          | 12/10/04  |
| Conditions of issue | This Test Report is issued subject to the conditions stated in 'terms and conditions' section of this                 |

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



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## *Summary*

This report is an application for modular certification of a transmitter operating under 47 CFR F15.247 of the FCC rules provided for operation of frequency hopping spread spectrum transmitters. The product covered by this report is OEM 100. The product was tested using the methods outlined in FCC public notice DA 00-705 (FHSS), released March 30, 2000, FCC public notice DA 00-1407 (modular) released June 26, 2000 and ANSI C63.4 (2003).

The RF circuitry in OEM 100 is similar to the Node which was tested previously under FCC ID: RNB19D8MN9LQ2WFA. OEM 100 was tested with all available options. Therefore, OEM100 testing also covers all other OEM series models, please see attached exhibit describing the differences among the OEM models.

This report presents the data obtained during the testing of Node for compliance with FCC 15.247. Furthermore, additional testing was done to ensure that spurious emissions from the product comply with FCC 15.209 limits when product is operated without an enclosure.

## *Test Methodology*

All testing was performed according to the procedures specified in ANSI C63.4 (2003).

|                                      |                |
|--------------------------------------|----------------|
| <b>Frequency range investigated:</b> | 150KHz – 10GHz |
|--------------------------------------|----------------|

| <b>Measurement Distance:</b>    |                     |                 |
|---------------------------------|---------------------|-----------------|
| <b>Frequency (MHz)</b>          | <b>Distance (m)</b> | <b>Comments</b> |
| 0.15MHz – 30MHz                 | -                   | Conducted       |
| 30MHz – 10GHz                   | -                   | Conducted       |
| 30MHz – 10GHz (restricted band) | 3 m                 | Spurious        |

The EUT was maximized around three orthogonal axes.

This product can be powered via battery or DC provided by the host unit. All testing was performed using an external DC source. AC line conducted emissions were performed using a 50Ω\50µH LISN on the AC side of support power supply.

All readings are peak unless otherwise noted.

## *EUT Configuration*

# EUT Configuration

**Work Order:** E0977  
**Company:** Sensicast Systems  
**Company Address:** 220 Reservoir St. #9  
Needham, MA 02494  
**Contact:** John O Brien  
**Person Present:** John O Brien

|   | <b>MN</b>  | <b>SN</b>        |               |                 |
|---|------------|------------------|---------------|-----------------|
| <b>EUT:</b>   | OEM100     | K66567           |               |                 |
| <b>EUT Description:</b> Wireless Integration Module                   |            |                  |               |                 |
| <b>EUT Max Frequency:</b> 928MHz                                      |            |                  |               |                 |
| <b>Support Equipment:</b>   | <b>MN</b>  | <b>SN</b>        |               |                 |
| DC power supply   | E3610A     | -                |               |                 |
| <b>EUT Cables:</b>  | <b>Qty</b> | <b>Shielded?</b> | <b>Length</b> | <b>Ferrites</b> |
| DC cable  | 1          | No               | 1 m           | None            |
| <b>Unpopulated EUT Ports:</b>   | <b>Qty</b> | <b>Reason</b>    |               |                 |
| None  |            |                  |               |                 |
| <b>Software / Operating Mode Description:</b>                         |            |                  |               |                 |
| Transmitting packets; channel hopping; exercising all board functions |            |                  |               |                 |
| Switching to receive mode in between transmissions.                   |            |                  |               |                 |

*Statement of Conformity*

The 915 MHz FHSS RF Module has been found to conform with the following parts of the 47 CFR as detailed below:

| <b>47 CFR Part #</b> | <b>47 CFR Part #</b> | <b>Comments</b>   |
|----------------------|----------------------|---|
|                      | 15.15(b)             | The product contains no user accessible controls that increase transmission power above allowable levels.   |
| 2.925                | 15.19                | The label is shown in the label exhibit.  |
|                      | 15.21                | Information to the user is shown in the instruction manual exhibit.   |
|                      | 15.27                | No special accessories are required for compliance.   |
|                      | 15.31(e)             | The input power was varied from its nominal value to $\pm 15\%$ . The respective radiated power was measured see table 1.                         |
|                      | 15.203               | The device utilizes antenna permanently attached to the board.  |
|                      | 15.204               | See attached documentation describing the antenna(s).   |
|                      | 15.205<br>15.209     | The fundamental is not in a Restricted band and the spurious emissions in the Restricted bands comply with the general emission limits of 15.209. |
|                      | 15.207               | Unit is DC powered. Conducted EMI data is provided in this report, table 9.   |
|                      | 15.247               | The unit complies with the frequency hopping requirements of 15.247   |

## *Test Data and Plots*

### **Channel Separation - Node**

#### **REQUIREMENT**

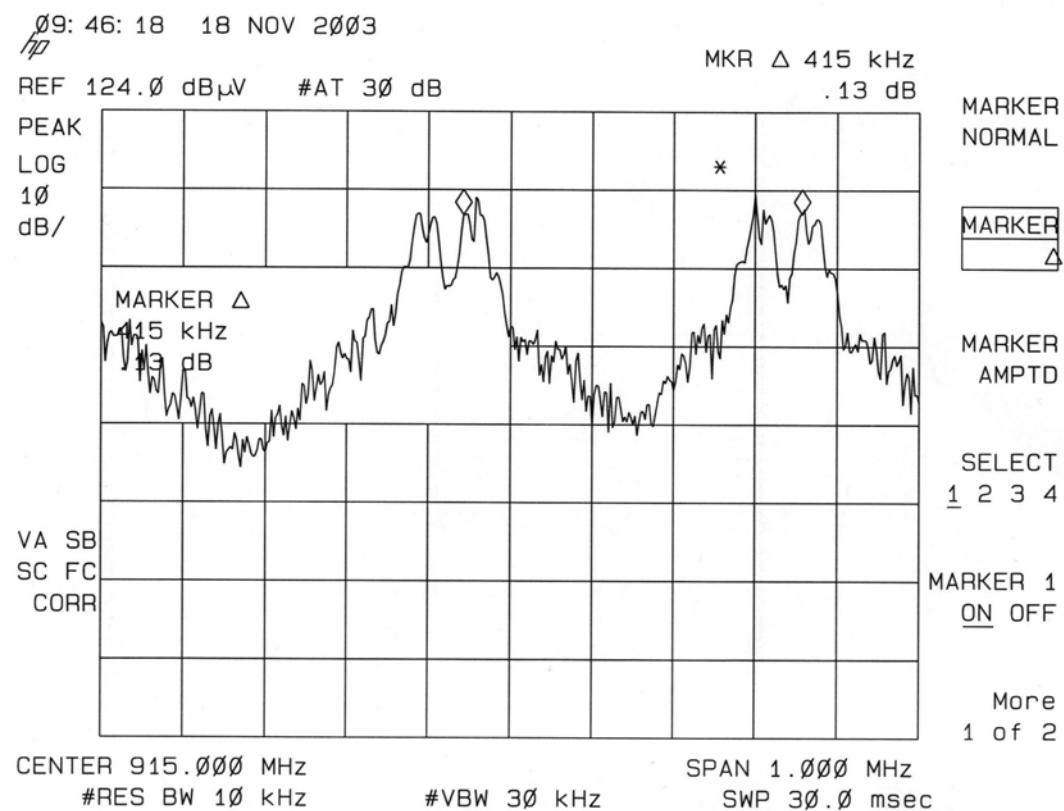
*“Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.” [15.247(a)(1)]*

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

#### **MEASUREMENT**

Channel separation = 415kHz

#### **ANALYZER PLOT**



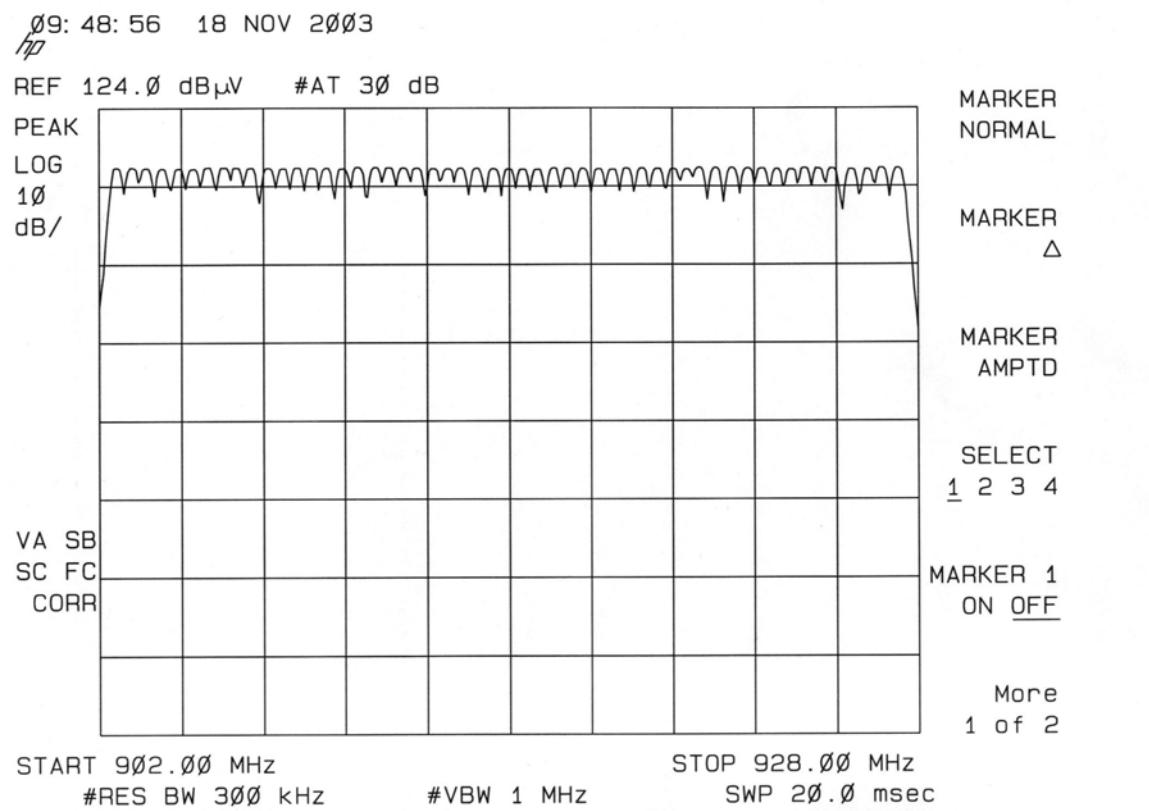
## ***Number of Hopping Frequencies - Node REQUIREMENT***

*“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**



## ***Time of Occupancy (Dwell Time) - Node***

### **REQUIREMENT**

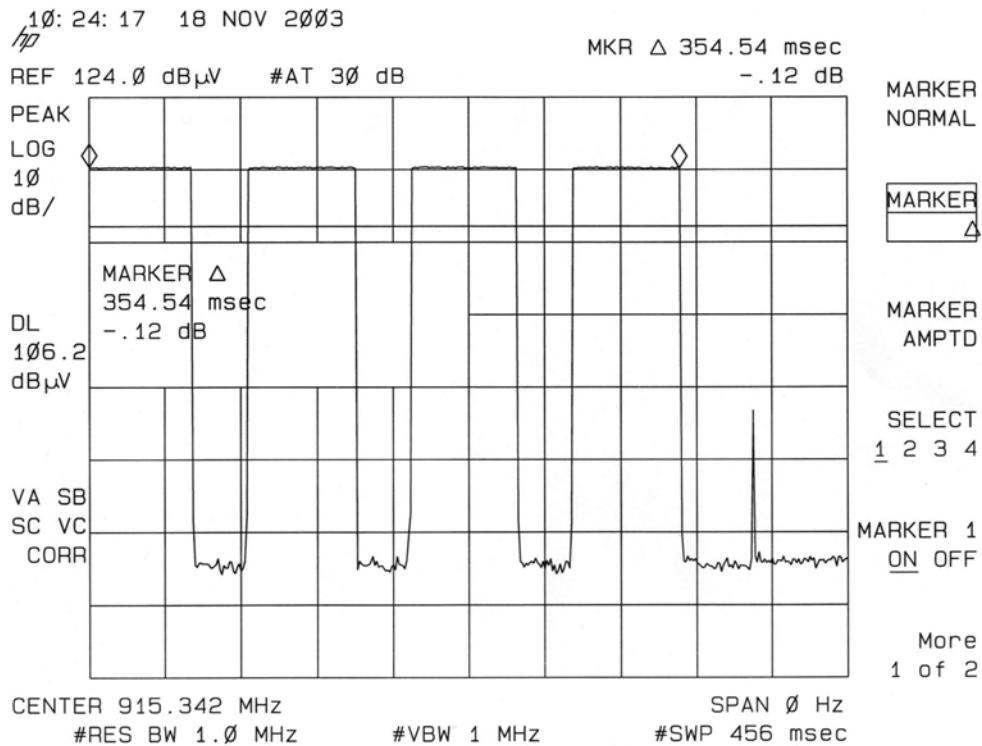
*“...the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period;” [14.247(a)(1)(i)]*

### **MEASUREMENTS**

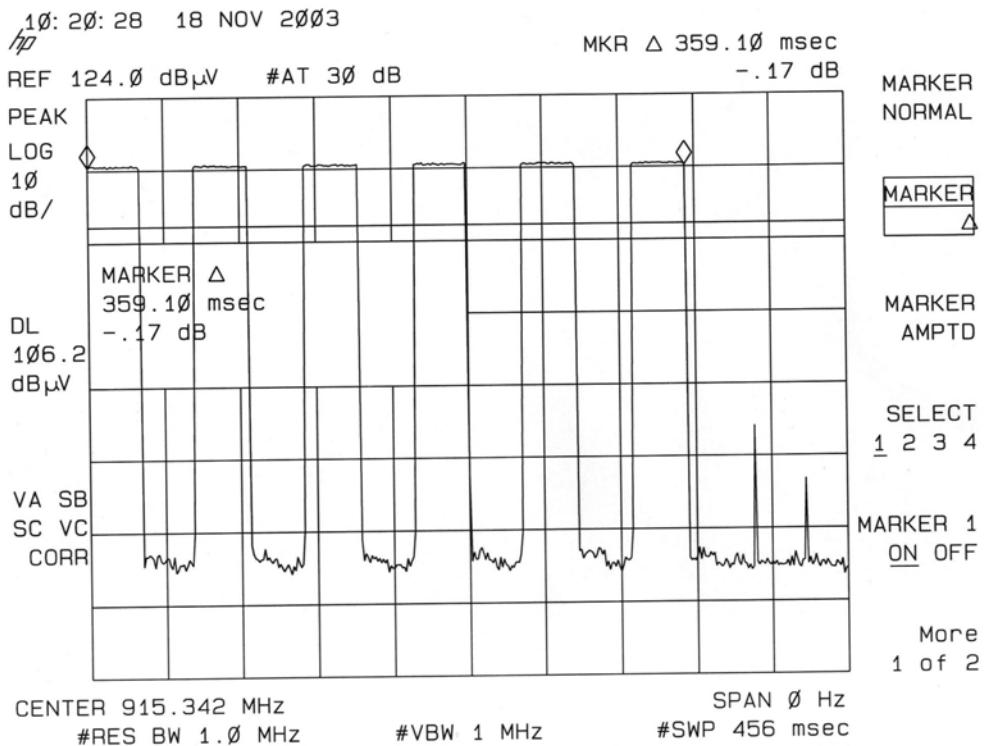
Plots of the dwell time were taken for three different data rates: 19.2, 38.4, and 76.8kbaud. Every 400ms, the EUT hops to the next channel in the pseudorandom hopping table. Since the hopping table is comprised of 53 different channels, the EUT will not return to the same channel twice in any 20s interval.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

Page 7 of 25

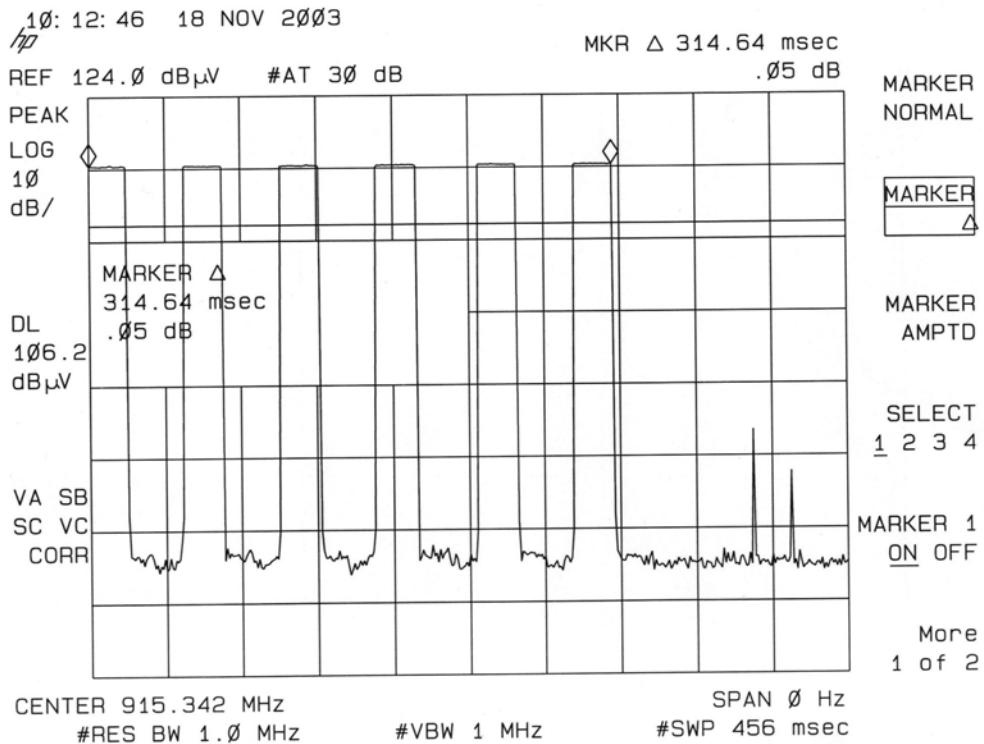
19.2kbaud – 354.5ms  
 38.4kbaud – 359.1ms  
 76.8kbaud – 314.6ms

**ANALYZER PLOTS****Dwell Time - 19.2kbaud**

## Dwell Time - 38.4kbaud



## Dwell Time - 76.8kbaud

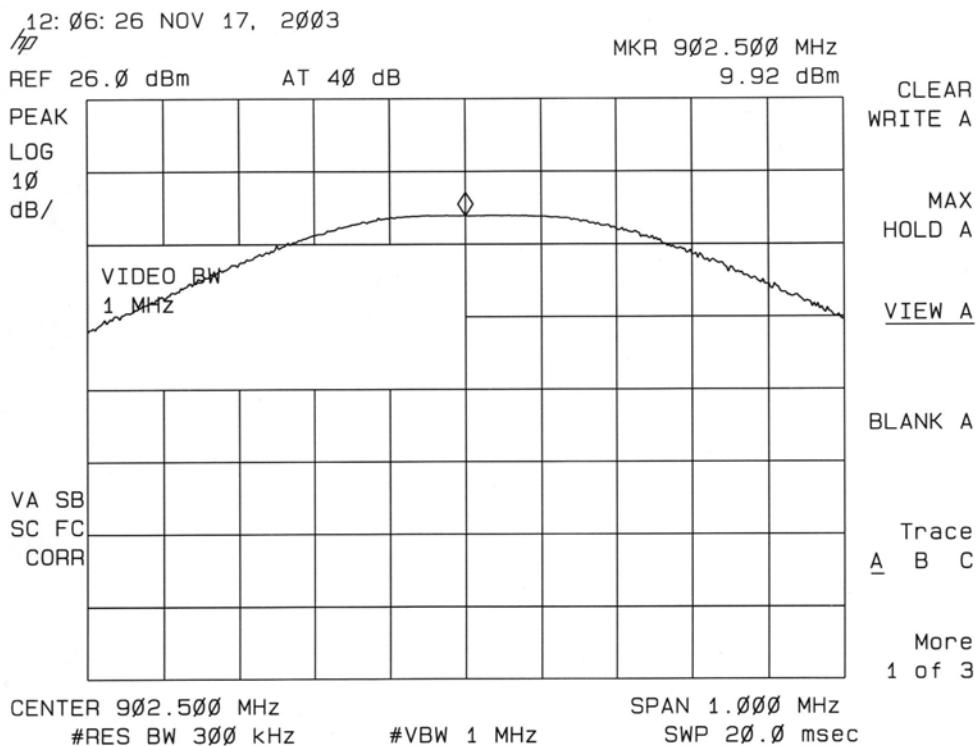


**Peak Output Power - Node****LIMIT**

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

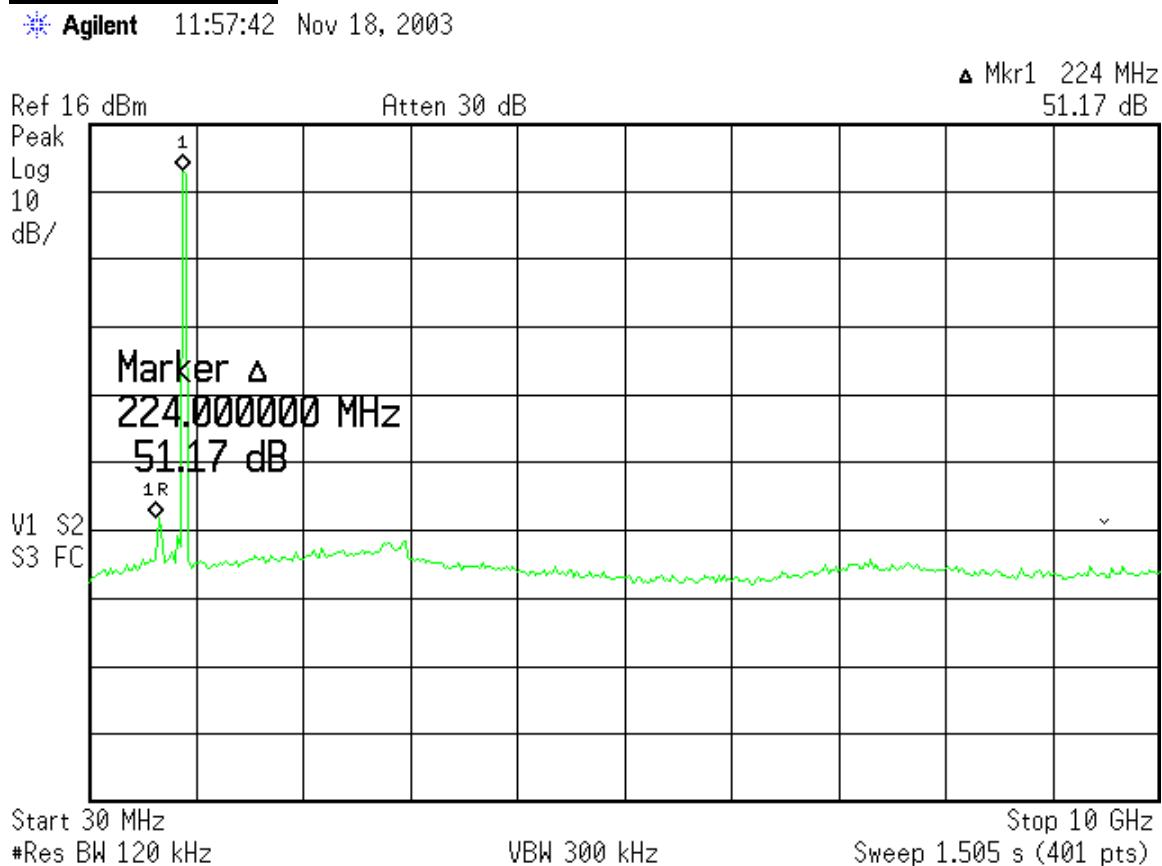
**SAMPLE ANALYZER PLOT****Channel 0**

***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 Band Edges - Node

### LIMITS

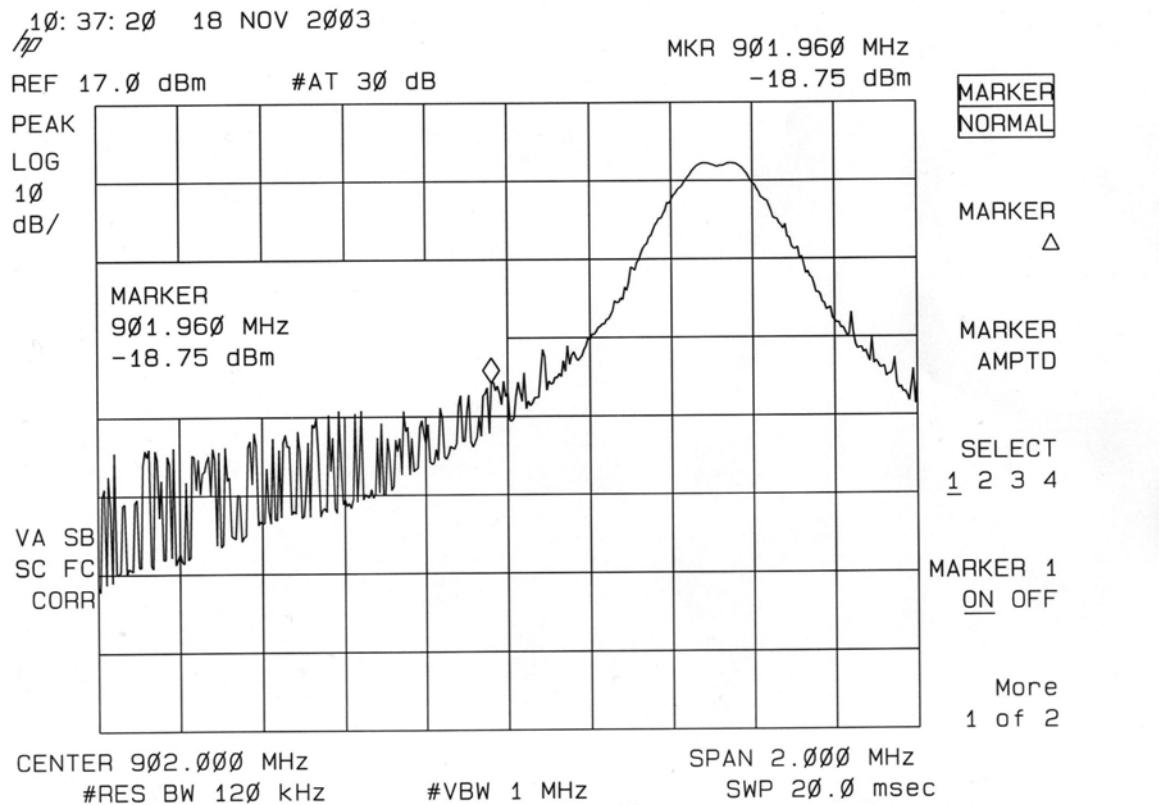
Peak: 20dB down from fundamental [15.247(c)]

### RESULTS

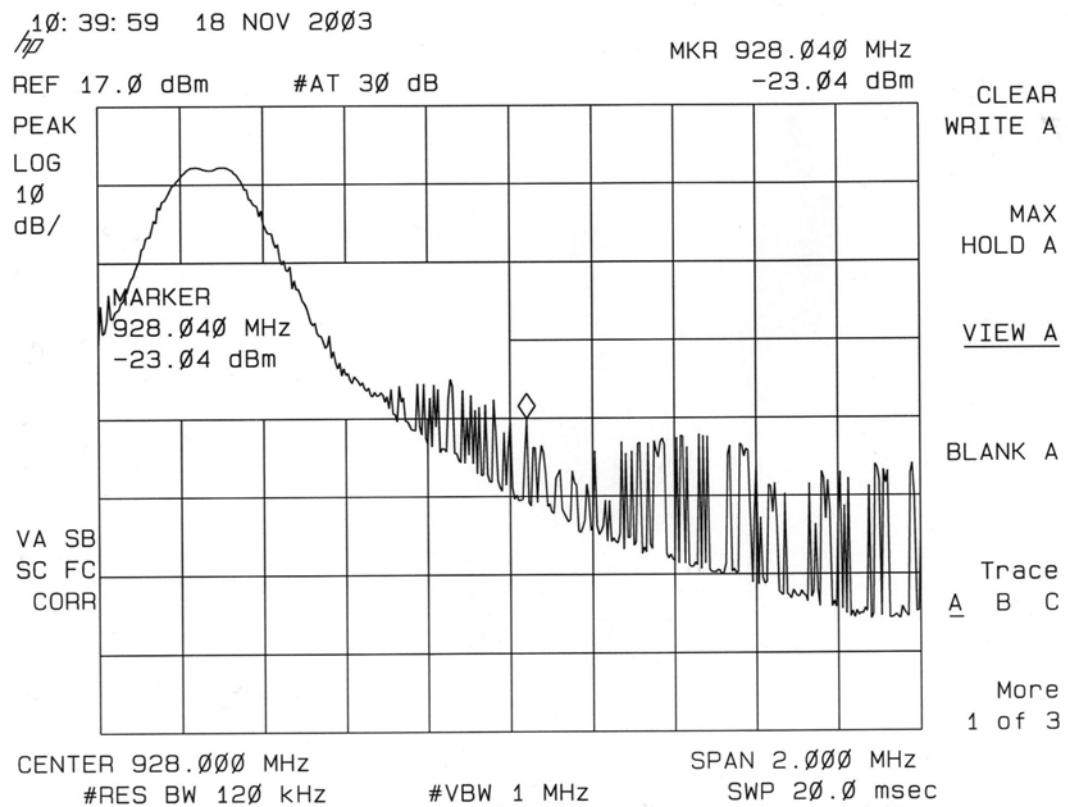
It can easily be seen in the plots shown below that the conducted band edges are at least 20dB down from the peak of the fundamental.

### ANALYZER PLOTS

#### Channel 0 - Low Band Edge



## Channel 52 – High Band Edge



## 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 $\mu$ V) | Preamp Factor (dB)    | Antenna Factor (dB/m) | Cable Factor (dB) | Adjusted Reading (dB $\mu$ V/m) | EIRP (dBm) | Conducted Output Power (dBm) | Directional Gain (dBi)       |                   |  |  |  |  |  |
| <u>Coordinator</u>           |                 |                      |                       |                       |                   |                                 |            |                              |                              |                   |  |  |  |  |  |
| 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                          |                   |  |  |  |  |  |
| <u>Node</u>                  |                 |                      |                       |                       |                   |                                 |            |                              |                              |                   |  |  |  |  |  |
| 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

| Radiated Emissions Table  |                 |                        |                            |                        |                   |                                 |                       |                                 |                           | Curtis-Straus LLC  |                      |  |  |  |  |
|---|-----------------|------------------------|----------------------------|------------------------|-------------------|---------------------------------|-----------------------|---------------------------------|---------------------------|--------------------|----------------------|--|--|--|--|
| Date: 23-Nov-04   |                 |                        | Company: Sensicast Systems |                        |                   |                                 |                       | Work Order: E0977               |                           |                    |                      |  |  |  |  |
| Engineer: Mairaj Hussain  |                 |                        | EUT Desc: OEM100           |                        |                   |                                 |                       |                                 |                           |                    |                      |  |  |  |  |
| Frequency Range: 30 -10000MHz   |                 |                        |                            |                        |                   |                                 |                       |                                 | Measurement Distance: 3 m |                    |                      |  |  |  |  |
| Notes: RBW:120KHz, VBW: 300KHz for frequencies<=1000MHz<br>RBW: 1MHz, VBW: 3MHz for frequencies > Ghz |                 |                        |                            |                        |                   |                                 |                       |                                 |                           |                    |                      |  |  |  |  |
| 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) | ---                   | Limit (dB $\mu$ V/m)            | Margin (dB)               | Result (Pass/Fail) | FCC Class B          |  |  |  |  |
| v   | 268.2           | 25.0                   | 22.3                       | 12.8                   | 2.3               | 17.8                            | ---                   | ---                             | ---                       | Pass               | Limit (dB $\mu$ V/m) |  |  |  |  |
| v   | 279.8           | 26.6                   | 22.3                       | 13.1                   | 2.3               | 19.7                            | ---                   | ---                             | ---                       | Pass               | Margin (dB)          |  |  |  |  |
| Table Result: Pass by -26.3 dB  |                 |                        |                            |                        |                   |                                 | Worst Freq: 279.8 MHz |                                 |                           |                    | Result (Pass/Fail)   |  |  |  |  |
| Test Site: "A"  |                 | Pre-Amp: Blue, Org-Blk |                            | Cable: 65 ft RG8A/U,#3 |                   | Analyzer: White                 |                       | Antenna: Blue-White, Black horn |                           |                    |                      |  |  |  |  |

**Section 15.31(e)**

| <b>FCC 15.31(e)</b>    |                           |                   |
|------------------------|---------------------------|-------------------|
| <b>Work Order:</b>     | E0977                     |                   |
| <b>Date:</b>           | 11/23/2004                |                   |
| <b>Engineer:</b>       | Mairaj Hussain            |                   |
| <b>EUT:</b>            | E0977                     |                   |
| <b>Company:</b>        | Sensicast Systems         |                   |
| Spectrum Analyzer:     | White                     |                   |
| Antenna:               | Blue-White                |                   |
| RBW: 120KHz            | VBW:                      | 1MHz              |
| <b>Operating range</b> | <b>1.8V DC -- 3.6V DC</b> |                   |
|                        | Vol<br>(DC)               | Reading<br>(dBuV) |
| Nominal                | 3.6                       | 81.3              |
|                        | 1.8                       | 73.5              |
| -15%                   | 1.53                      | Tx turns off      |
|                        | 1.598                     | 70.5              |
|                        | 3.677                     | Tx turns off      |
| 15%                    | 4.14                      | Tx turns off      |

|                    |   |
|--------------------|---|
| <b>Conclusion:</b> | The peak output power does not change with input voltage. |
|--------------------|---|

*Note: Above PoP readings are off of spectrum analyzer and do not take in account for cables loss and any attenuator used.*

## AC Line Conducted Emission Measurements

| AC Mains Conducted Emissions                     |                            |                  |                  |                  |                       |                    |                          |                       |              | Curtis-Straus LLC      |               |                            |  |  |
|--|----------------------------|------------------|------------------|------------------|-----------------------|--------------------|--------------------------|-----------------------|--------------|------------------------|---------------|----------------------------|--|--|
| Date: 23-Nov-04                                  | Company: Sensicast Systems |                  |                  |                  |                       |                    | Work Order: E0977        |                       |              |                        |               |                            |  |  |
| Engineer: Mairaj Hussain                         | EUT Desc: OEM100           |                  |                  |                  |                       |                    | Test Site: EMI2          |                       |              |                        |               |                            |  |  |
| Notes: AC side of DC supply RBW: 9KHz; VBW 30KHz |                            |                  |                  |                  |                       |                    |                          |                       |              |                        |               |                            |  |  |
| LISN(s): Yellow-Black                            |                            |                  |                  |                  |                       |                    |                          |                       |              |                        |               |                            |  |  |
| Range: 0.15-30MHz                                | Other Equipment: ---       |                  |                  |                  |                       |                    | Spectrum Analyzer: White |                       |              |                        |               |                            |  |  |
| Frequency (MHz)                                  | Q.P. Readings              |                  | Ave. Readings    |                  | Impedance Factor (dB) | ---                |                          | FCC/CISPR B           |              | FCC/CISPR B            |               | Overall Result (Pass/Fail) |  |  |
|  | QP1 (dB $\mu$ V)           | QP2 (dB $\mu$ V) | AV1 (dB $\mu$ V) | AV2 (dB $\mu$ V) |                       | Limit (dB $\mu$ V) | Margin dB                | qp Limit (dB $\mu$ V) | qp Margin dB | Ave Limit (dB $\mu$ V) | Ave Margin dB |                            |  |  |
| 0.15   | 20.9                       | 20.3             |                  |                  | 20.0                  | ---                | 66.0                     | -25.1                 | 56.0         | -15.1                  | Pass          |                            |  |  |
| 0.18   | 17.6                       | 12.6             |                  |                  | 20.0                  | ---                | 64.5                     | -26.9                 | 54.5         | -16.9                  | Pass          |                            |  |  |
| 0.68   | 11.6                       | 10.6             |                  |                  | 20.0                  | ---                | 56.0                     | -24.4                 | 46.0         | -14.4                  | Pass          |                            |  |  |
| 1.49   | 5.9                        | 8.3              |                  |                  | 20.0                  | ---                | 56.0                     | -27.7                 | 46.0         | -17.7                  | Pass          |                            |  |  |
| 14.40  | -1.8                       | -1.2             |                  |                  | 20.0                  | ---                | 60.0                     | -41.2                 | 50.0         | -31.2                  | Pass          |                            |  |  |
| 20.00  | -1.8                       | -0.8             |                  |                  | 20.0                  | ---                | 60.0                     | -40.8                 | 50.0         | -30.8                  | Pass          |                            |  |  |

**Table Result:** Pass

by -14.40 dB

**Worst Freq:**

0.68 MHz

### LIMITS

Quasi-Peak:  $250\mu\text{V} = 47.9\text{dB}\mu\text{V}$  in the range 450kHz to 30MHz

[47 CFR 15.207(a) Revised as of October 1, 2001]

**Note:** On July 12, 2004, FCC adopts the conducted emissions limits of the European CISPR 22 standard as outlined below

| 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) Revised as of October 1, 2002; amended by ET Docket 98-80; FCC 02-157, published in the Federal Register Vol. 67, No. 132, on Wednesday, July 10, 2002]

## Test Equipment Used

REV. 16-NOV-2004

| SPECTRUM ANALYZERS / RECEIVERS  |              | RANGE                 | MN                 | MFR            | SN    | ASSET           | CALIBRATION DUE |
|---------------------------------|--------------|-----------------------|--------------------|----------------|-------|-----------------|-----------------|
| RED                             | 9kHz-1.8GHz  | 8591E                 | HP                 | 3441A03559     | 00024 | 26-MAY-2005     |                 |
| WHITE                           | 9kHz-22GHz   | 8593E                 | HP                 | 3547U01252     | 00022 | 04-MAR-2005     |                 |
| BLUE                            | 9kHz-1.8GHz  | 8591E                 | HP                 | 3223A00227     | 00070 | 03-NOV-2005     |                 |
| YELLOW                          | 9kHz-2.9GHz  | 8594E                 | HP                 | 3523A01958     | 00100 | 11-AUG-2005     |                 |
| GREEN                           | 9kHz-26.5GHz | 8593E                 | HP                 | 3829A03618     | 00143 | 02-AUG-2005     |                 |
| BLACK                           | 9kHz-12.8GHz | 8596E                 | HP                 | 3710A00944     | 00337 | 18-AUG-2005     |                 |
| YELLOW-BLACK                    | 20Hz-40.0MHz | 3585A                 | HP                 | 2504A05219     | 00030 | 08-OCT-2005     |                 |
| TELECOM 3583A                   | 20Hz-40.0MHz | 3585A                 | HP                 | 1750A02762     | 01067 | 03-SEP-2005     |                 |
| ORANGE                          | 9kHz-26.5GHz | E4407B                | HP                 | US39440975     | 00394 | 05-NOV-2005     |                 |
| EMI TEST RECEIVER               | 20-1000MHz   | ESVS30                | R&S                | 827957/001     | 01098 | 27-OCT-2005     |                 |
| LISNs/MEASUREMENT PROBES        |              | RANGE                 | MN                 | MFR            | SN    | ASSET           | CALIBRATION DUE |
| RED                             | 10kHz-30MHz  | 8012-50-R-24-BNC      | SOLAR              | 956348         | 00753 | 02-APR-2005     |                 |
| BLUE                            | 10kHz-30MHz  | 8012-50-R-24-BNC      | SOLAR              | 956349         | 00752 | 02-APR-2005     |                 |
| YELLOW-BLACK                    | 10kHz-30MHz  | 8012-50-R-24-BNC      | SOLAR              | 984735         | 00248 | 02-APR-2005     |                 |
| ORANGE                          | 10kHz-30MHz  | 8012-50-R-24-BNC      | SOLAR              | 903707         | 00754 | 02-APR-2005     |                 |
| GOLD                            | 10kHz-30MHz  | 8012-50-R-24-BNC      | SOLAR              | 984734         | 00247 | 02-APR-2005     |                 |
| WHITE-BLACK                     | 10kHz-30MHz  | 8610-50-TS-100-N      | SOLAR              | 972019         | 00678 | 02-APR-2005     |                 |
| BLACK                           | 10kHz-30MHz  | 8610-50-TS-100-N      | SOLAR              | 972017         | 00675 | 02-APR-2005     |                 |
| RED-BLACK                       | 10kHz-30MHz  | 8610-50-TS-100-N      | SOLAR              | 972016         | 00677 | 02-APR-2005     |                 |
| BLUE-BLACK                      | 10kHz-30MHz  | 8610-50-TS-100-N      | SOLAR              | 972018         | 00676 | 02-APR-2005     |                 |
| BLUE MONITORING PROBE           | 0.01-150MHz  | 91550-2               | TEGAM              | 12350          | 00807 | 21-MAY-2005     |                 |
| YELLOW MONITORING PROBE         | 0.01-150MHz  | 91550-2               | ETS                | 50972          | 00493 | 24-NOV-2004     |                 |
| GREEN CURRENT TRANSFORMER       | 40Hz-20MHz   | 150                   | PEARSON            | 10226          | 00793 | 03-APR-2005     |                 |
| CISPR LINE PROBE                | 150kHz-30MHz | N/A                   | C-S                | 01             | 00805 | 20-DEC-2004     |                 |
| CISPR TELCO VOLTAGE PROBE       | 10kHz-30MHz  | CS A/C-10             | C-S                | CS01           | 00296 | 28-SEP-2005     |                 |
| CISPR 22 TELCO ISN              | 9kHz-30MHz   | FCC-TLISN-T4          | FISCHER            | 20115          | 00746 | 26-OCT-2006     |                 |
| OPEN AREA TEST SITE (OATS)      |              | FCC CODE              | IC CODE            | VCCI CODE      |       | CALIBRATION DUE |                 |
| SITE F                          |              | 93448                 | IC 2762-F          | R-1688         |       | 25-MAR-2005     |                 |
| SITE T                          |              | 93448                 | IC 2762-T          | R-905          |       | 25-MAR-2005     |                 |
| SITE A                          |              | 93448                 | IC 2762-A          | R-903          |       | 25-MAR-2005     |                 |
| SITE M                          |              | 93448                 | IC 2762-M          | R-904          |       | 25-MAR-2005     |                 |
| BUBBLE (HP FACILITY)            |              | N/A                   | N/A                | R-1467         |       | 16-MAY-2005     |                 |
| LINE CONDUCTED TEST SITES       |              | FCC CODE              | IC CODE            | VCCI CODE      |       | CALIBRATION DUE |                 |
| EMI 1                           |              | 93448                 | N/A                | C-1801         |       | 01-MAY-2006     |                 |
| EMI 2                           |              | 93448                 | N/A                | C-1802         |       | 01-MAY-2006     |                 |
| EMI 3                           |              | 93448                 | N/A                | C-1803         |       | 01-MAY-2006     |                 |
| BUBBLE (HP FACILITY)            |              | N/A                   | N/A                | C-1556         |       | 16-MAY-2005     |                 |
| PREAMPS / ATTENUATORS / FILTERS |              | RANGE                 | MN                 | MFR            | SN    | ASSET           | CALIBRATION DUE |
| RED                             | 0.10-2000MHz | ZFL-1000-LN           | C-S                | N/A            | 00798 | 31-MAR-2005     |                 |
| BLUE                            | 0.01-2000MHz | ZFL-1000-LN           | C-S                | N/A            | 00759 | 26-JUL-2005     |                 |
| BLUE-BLACK                      | 0.01-2000MHz | ZFL-1000-LN           | C-S                | N/A            | 00800 | 31-MAR-2005     |                 |
| GREEN                           | 0.01-2000MHz | ZFL-1000-LN           | C-S                | N/A            | 00802 | 27-FEB-2005     |                 |
| BLACK                           | 0.01-2000MHz | ZFL-1000-LN           | C-S                | N/A            | 00799 | 27-FEB-2005     |                 |
| ORANGE                          | 0.01-2000MHz | ZFL-1000-LN           | C-S                | N/A            | 00765 | 27-FEB-2005     |                 |
| WHITE                           | 1-20GHz      | SMC-12A               | C-S                | 426643         | 00760 | 21-JUL-2005     |                 |
| YELLOW-BLACK                    | 1-20GHz      | SMC-12A               | C-S                | 535055         | 00801 | 21-JUL-2005     |                 |
| ORANGE-BLACK                    | 1-20GHz      | SMC-12A               | C-S                | 637367         | 00761 | 21-JUL-2005     |                 |
| HF (YELLOW)                     | 18-26.5GHz   | AFS4-18002650-60-8P-4 | C-S                | 467559         | 00758 | 20-JUL-2005     |                 |
| HIGH PASS FILTER                | 1-18 GHz     | SPA-F-55204           | K&L                | 36             | 00817 | 06-JAN-2006     |                 |
| LOW PASS FILTER                 | 1-9 GHz      | 11SL10-4100/X4400-O/O | K&L                | 4              | 00816 | 06-JAN-2006     |                 |
| HF 20dB ATTENUATOR              | 0.03-20 GHz  | PE 7019-20            | PASTERNAK          | 01             | 00791 | 21-MAY-2005     |                 |
| LOW FREQ LPF                    | 10-100kHz    | L200K1G1              | MICROWAVE CIRCUITS | 4460-01 DC0432 | 1019  | 30-AUG-2005     |                 |

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| LOW FREQ LPF                  | 10-100kHz | L200K1G1                   |                 | MICROWAVE CIRCUITS | 4777-01<br>DC0434     | 1088  | 30-AUG-2005                          |
|-------------------------------|-----------|----------------------------|-----------------|--------------------|-----------------------|---|--------------------------------------|
| <b>ANTENNAS</b>               |           | RANGE                      | MN              | MFR                | SN                    | ASSET   | CALIBRATION DUE                      |
| GREEN BILOG                   |           | 30-2000MHz                 | CBL6112B        | CHASE              | 2742                  | 00620   | 06-APR-2006                          |
| GREEN-BLACK BILOG             |           | 30-2000MHz                 | CBL6112B        | CHASE              | 2412                  | 00127   | 06-JAN-2006                          |
| GREEN-RED BILOG               |           | 30-2000MHz                 | CBL6112B        | CHASE              | 2435                  | 00990   | 06-APR-2006                          |
| BLUE-WHITE BILOG              |           | 30-2000MHz                 | 3142B           | EMCO               | 1527                  | TELOGY<br>RENTAL  | 03-AUG-2006                          |
| RED BILOG                     |           | 30-1000MHz                 | 3143            | EMCO               | 1270                  | 00042   | 17-MAR-2005                          |
| BLUE BILOG                    |           | 30-1000MHz                 | 3143            | EMCO               | 1271                  | 00803   | 17-MAR-2005                          |
| GRAY BILOG                    |           | 26-2000MHz                 | 3141            | EMCO               | 9703-1038             | 00066   | 19-MAY-2005(EMI) / 21-JUN-2005(RFI)  |
| YELLOW-BLACK BILOG            |           | 20-2000MHz                 | CBL6140A        | CHASE              | 1112                  | 00126   | 19-MAY-2005(EMI) / 25-JUN-2005(RFI)  |
| RED-WHITE BILOG               |           | 30-2000MHz                 | JB1             | SUNOL              | A091604-1             | 01105   | 28-SEP-2005                          |
| RED-BLACK BILOG               |           | 30-2000MHz                 | JB1             | SINOL              | A091604-2             | 01106   | 28-SEP-2005                          |
| YELLOW HORN                   |           | 1-18GHz                    | 3115            | EMCO               | 9608-4898             | 00037   | 22-MAY-2005(EMI) / 28-SEP-2005 (RFI) |
| BLACK HORN                    |           | 1-18GHz                    | 3115            | EMCO               | 9703-5148             | 00056   | 12-JUN-2005                          |
| ORANGE HORN                   |           | 1-18GHz                    | 3115            | EMCO               | 0004-6123             | 00390   | 04-JUN-2005                          |
| HF (WHITE) HORN               |           | 18-26.5GHz                 | 801-WLM         | WAVELINE           | 00758                 | 00758   | 15-JUL-2005                          |
| SMALL LOOP (RENTAL)           |           | 10kHz-30MHz                | PLA-130/A       | ARA                | 1009                  | TELOGY  | 11-FEB-2006                          |
| SMALL LOOP                    |           | 9kHz-30MHz                 | PLA-130/A       | ARA                | 1024                  | 00755   | 23-FEB-2006                          |
| LARGE LOOP                    |           | 20Hz-5MHz                  | 6511            | EMCO               | 9704-1154             | 00067   | 12-NOV-2005                          |
| ACTIVE MONOPOLE               |           | 30Hz-30MHz                 | 3301B           | EMCO               | 3824                  | 00068   | 05-MAY-2005                          |
| INDUCTION COIL                |           | 50-60Hz                    | 1000-4-8        | C-S                | N/A                   | 00778   | 13-SEP-2006                          |
| ADJUSTABLE DIPOLE             |           | 30-1000MHz                 | 3121C           | EMCO               | 1370                  | 00757   | 26-JUN-2005                          |
| ADJUSTABLE DIPOLE             |           | 30-1000MHz                 | 3121C           | EMCO               | 1371                  | 00756   | 26-JUN-2005                          |
| RE101 LOOP SENSOR             |           | 30Hz-100kHz                | RE101-13.3cm    | C-S                | N/A                   | 00818   | 07-JAN-2005                          |
| RS101 RADIATING LOOP          |           | 30Hz-100kHz                | RS101-12CM      | C-S                | N/A                   | 00819   | 07-JAN-2005                          |
| RS101 LOOP SENSOR             |           | 30Hz-100kHz                | RS101-4CM       | C-S                | N/A                   | 00820   | 07-JAN-2005                          |
| <b>MIXERS/DIPLEXERS</b>       |           | RANGE                      | MN              | MFR                | SN                    | ASSET   | CALIBRATION DUE                      |
| MIXER / HORN                  |           | 26.5-40 GHz                | 11970A/28-442-6 | HP/ATM             | 2332A00900/A046903-01 | 00369   | N/A                                  |
| MIXER / HORN                  |           | 26.5-40 GHz                | 11970A/28-442-6 | HP/ATM             | 2332A01695/A046903-01 | 1087  | 23-AUG-2005                          |
| MIXER / HORN                  |           | 26.5-40 GHz                | 11970A/28-442-6 | HP/ATM             | 3003A07825/A046903-01 | 1086  | 23-AUG-2005                          |
| MIXER / HORN                  |           | 40-60 GHz                  | M19HW/A         | OML                | U30110-1              | 00821   | 03-JAN-2005                          |
| MIXER / HORN                  |           | 60-90 GHz                  | M12HW/A         | OML                | E30110-1              | 00822   | 03-JAN-2005                          |
| MIXER / HORN                  |           | 90-140 GHz                 | MO8HW/A         | OML                | F21206-1              | 00811   | 05-DEC-2004                          |
| MIXER / HORN                  |           | 140-220 GHz                | MO5HW/A         | OML                | G21206-1              | 00812   | 05-DEC-2004                          |
| DIPLEXER                      |           |                            | DPL.26          | OML                | N/A                   | 00813   | 05-DEC-2004                          |
| <b>ABSORBING CLAMPS</b>       |           | RANGE                      | MN              | MFR                | SN                    | ASSET   | CALIBRATION DUE                      |
| FISCHER CLAMP                 |           | 30-1000MHz                 | F-201-23MM      | FISCHER            | 10                    | 00081   | 16-JAN-2006                          |
| <b>EFT</b>                    |           | MN                         | MFR             | SN                 | ASSET                 | CALIBRATION DUE   |                                      |
| EFT DIRECT COUPLING CAP       |           | N/A                        | C-S             | 01                 | 00794                 | 29-JAN-2006   |                                      |
| <b>ESD GENERATORS</b>         |           | MN                         | MFR             | SN                 | ASSET                 | CALIBRATION DUE   |                                      |
| GREEN                         |           | NSG435                     | SCHAFFNER       | 000839             | 00763                 | 02-DEC-2004   |                                      |
| RED                           |           | NSG435                     | SCHAFFNER       | 001625             | 00762                 | 09-DEC-2004   |                                      |
| YELLOW                        |           | 930D                       | ETS             | 201                | 00673                 | 16-JUN-2005   |                                      |
| <b>BEST EMC-2</b>             |           | MN                         | MFR             | SN                 | ASSET                 | CALIBRATION DUE   |                                      |
| BLUE                          |           | 711-1100                   | SCHAFFNER       | 199824-002SC       | 00117                 | 28-JUL-2005 (SURGE/D+I/EFT)                                 |                                      |
| RED                           |           | 711-1100                   | SCHAFFNER       | 200122-074SC       | 00623                 | 24-JUN-2005 (SURGE) / 28-JUL-2005 (D+I) / 05-DEC-2004 (EFT) |                                      |
| <b>CHAMBERS AND STRIPLINE</b> |           | MN                         | MFR             | SN                 | ASSET                 | CALIBRATION DUE   |                                      |
| RFI 1 CHAMBER                 |           | 3 METER COMPACT            | PANASHIELD      | N/A                | 00797                 | 25-JUN-2005   |                                      |
| RFI 2 CHAMBER                 |           | 04' x 07' SHIELDING SYSTEM | LINDGREN        | 13329              | 00795                 | 21-JUN-2005   |                                      |
| RFI 3 STRIPLINE               |           | N/A                        | C-S             | N/A                | 00796                 | 22-JUL-2005   |                                      |
| ENVIRONMENTAL (SAFETY)        |           | SGTH-31S                   | B-M-A INC.      | 2245               | 00321                 | 31-DEC-2004   |                                      |

| <b>HARMONIC ANALYZER</b>            |              | MN                | MFR     | SN          | ASSET           | CALIBRATION DUE                      |
|-------------------------------------|--------------|-------------------|---------|-------------|-----------------|--------------------------------------|
| HFTS                                |              | HP6842A           | HP      | 3531A-00169 | 00738           | 03-DEC-2005                          |
| <b>FREQUENCY COUNTER</b>            |              | MN                | MFR     | SN          | ASSET           | CALIBRATION DUE                      |
| 5340A                               |              | HP5340A           | HP      | 1440A02320  | 00787           | 30-JUL-2004                          |
| <b>AMPLIFIERS</b>                   |              | MN                | MFR     | SN          | ASSET           | CALIBRATION DUE                      |
| RED                                 | 0.5-1000MHz  | 10W1000B          | AR      | 18708       | 00032           | 23-JUN-2005                          |
| GREEN                               | 0.5-1000MHz  | 10W1000B          | AR      | 23423       | 00123           | 01-JUN-2005                          |
| BLUE                                | 0.01-250MHz  | 75A250            | AR      | 19165       | 00039           | 19-JAN-2005(CRFI) / 23-JUN-2005(RFI) |
| BLACK                               | 0.01-250MHz  | 75A250            | AR      | 23411       | 00122           | 22-JUN-2005(CRFI) / 25-JUN-2005(RFI) |
| ORANGE                              | 0.01-250MHz  | 75A250            | AR      | 26827       | 00367           | 19-JAN-2005(CRFI) / 02-JUN-2005(RFI) |
| HP489A                              | 1.0-2.0GHz   | HP489A            | HP      | 449-00762   | 00971           | 28-SEP-2005                          |
| HP491C                              | 2.0-4.0GHz   | HP491C            | HP      | 449-00638   | 00764           | 28-SEP-2005                          |
| HP493A #1                           | 4.0-8.0GHz   | HP493A            | HP      | 171402242   | 00085           | 28-SEP-2005                          |
| HP493A #2                           | 4.0-8.0GHz   | HP493A            | HP      | 449-00562   | 00771           | 28-SEP-2005                          |
| HP495A                              | 7.0-12.0GHz  | HP495A            | HP      | 904-00237   | 00086           | 28-SEP-2005                          |
| <b>FIELD PROBES</b>                 |              | MN                | MFR     | SN          | ASSET           | CALIBRATION DUE                      |
| RED                                 | 0.01-1000MHz | HI-4422           | HOLADAY | 90369       | 00031           | 11-OCT-2005                          |
| GREEN                               | 0.01-1000MHz | HI-4422           | HOLADAY | 97363       | 00136           | 05-AUG-2005                          |
| BLUE                                | 0.01-1000MHz | HI-4422           | HOLADAY | 95696       | 01100           | 27-OCT-2005                          |
| <b>SIGNAL GENERATORS</b>            |              | MN                | MFR     | SN          | ASSET           | CALIBRATION DUE                      |
| RED                                 | 0.09-2000MHz | HP8648B           | HP      | 3847U02192  | 00366           | 15-JAN-2005                          |
| BLUE                                | 0.1-1000MHz  | HP8648A           | HP      | 3426A00548  | 00034           | 20-JUL-2005                          |
| GREEN                               | 0.09-2000MHz | HP8648B           | HP      | 3623A02072  | 00125           | 12-OCT-2005                          |
| ORANGE                              | 0.1-1000MHz  | HP8648B           | HP      | 3537A01210  | 00025           | 26-MAY-2005                          |
| BLACK (TELECOM)                     | 15MHz        | HP33120A          | HP      | US36004674  | 00766           | 21-OCT-2005                          |
| YELLOW                              | 15MHz        | HP33120A          | HP      | US36014119  | 00249           | 26-MAY-2005                          |
| BLUE-WHITE                          | 0.1Hz-13MHz  | HP3312A           | HP      | 1432A07632  | 00775           | 09-MAR-2005                          |
| SWEEPER                             | 0.01-20.0GHz | HP83752A          | HP      | 3610A01133  | 00087           | 04-APR-2005                          |
| AM/FM STEREO SIG. GEN.              | 0.1-170MHz   | LG3236            | LEADER  | 3687301     | 00959           | 03-SEP-2005                          |
| <b>BULK INJECTION CLAMPS</b>        |              | MN                | MFR     | SN          | ASSET           | CALIBRATION DUE                      |
| GREEN                               | 0.01-100MHz  | 95236-1           | ETS     | 50215       | 00118           | 22-JUN-2005                          |
| RED                                 | 0.01-100MHz  | 95236-1           | ETS     | 34026       | 1020            | 07-JUL-2005                          |
| <b>CDN NETWORKS</b>                 |              | MN                | MFR     | ASSET       | CALIBRATION DUE |                                      |
| BLACK                               | 0.10-100MHz  | 20A M-2           | C-S     | 00783       | 22-JUN-2005     |                                      |
| BLUE                                | 0.10-100MHz  | 15A M-3           | C-S     | 00806       | 22-JUN-2005     |                                      |
| ORANGE                              | 0.10-100MHz  | 15A M-2           | C-S     | 00786       | 22-JUN-2005     |                                      |
| RED                                 | 0.10-100MHz  | 15A M-3           | C-S     | 00780       | 22-JUN-2005     |                                      |
| WHITE                               | 0.10-100MHz  | 15A M-3           | C-S     | 00782       | 22-JUN-2005     |                                      |
| YELLOW-BLACK                        | 0.10-100MHz  | 15A M-3           | C-S     | 00784       | 22-JUN-2005     |                                      |
| BLUE-BLACK                          | 0.10-100MHz  | 15A M-3           | C-S     | 00781       | 22-JUN-2005     |                                      |
| GREEN                               | 0.10-100MHz  | 30A M-3           | C-S     | 00779       | 22-JUN-2005     |                                      |
| YELLOW                              | 0.10-100MHz  | 30A M-5           | C-S     | 00804       | 22-JUN-2005     |                                      |
| BLUE-WHITE                          | 0.10-100MHz  | 15A M-5           | C-S     | 00788       | 22-JUN-2005     |                                      |
| YELLOW (RES)                        | 0.10-100MHz  | 100Ω RESISTOR Nwk | C-S     | 00810       | 28-SEP-2005     |                                      |
| GREEN (RES)                         | 0.10-100MHz  | 100Ω RESISTOR Nwk | C-S     | 00785       | 09-MAR-2005     |                                      |
| <b>OSCILLOSCOPES</b>                |              | MN                | MFR     | SN          | ASSET           | CALIBRATION DUE                      |
| OSCILLOSCOPE 100MHz                 | TDS 220      | TEKTRONIX         |         | B068748     | 00885           | 02-JUN-2005                          |
| OSCILLOSCOPE 100MHz (SAFETY)        | TDS 340      | TEKTRONIX         |         | B012357     | 00737           | 05-OCT-2005                          |
| OSCILLOSCOPE 100MHz (TELECOM)       | 54645A       | HP                |         | US36320452  | 00103           | 02-JUL-2005                          |
| <b>RMS VOLTMETERS/CURRENT CLAMP</b> |              | MN                | MNFR    | SN          | ASSET           | CALIBRATION DUE                      |
| TRUE-RMS MULTIMETER                 | 79III        | FLUKE             |         | 71700298    | 00769           | 21-OCT-2005                          |
| TRUE-RMS MULTIMETER                 | 177          | FLUKE             |         | 83390024    | 00973           | 08-MAR-2005                          |
| TRUE-RMS MULTIMETER (REFERENCE)     | 177          | FLUKE             |         | 83390025    | 00974           | 08-MAR-2005                          |
| TRUE-RMS MULTIMETER (TELECOM)       | 177          | FLUKE             |         | 83430419    | 00975           | 08-MAR-2005                          |
| TRUE-RMS CLAMP METER (SAFETY)       | 36           | FLUKE             |         | 68805882    | 00700           | 05-MAR-2005                          |
| <b>SURGE GENERATORS</b>             |              | MN                | MFR     | SN          | ASSET           | CALIBRATION DUE                      |

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|   |                 |         |        |           |             |
|---|-----------------|---------|--------|-----------|-------------|
| TRANSIENT WAVEFORM MONITOR              | TWM-5           | CDI     | 003982 | 00323     | 17-JUN-2005 |
| UNIVERSAL SURGE GENERATOR               | M5              | CDI     | 003966 | 00324     | 09-JUN-2005 |
| THREE PHASE COUPLING Nwk                | 3CN             | CDI     | 003455 | 00325     | 09-JUN-2005 |
| 1.2X50US PLUGIN MODULE                  | 1.2X50US PLUGIN | CDI     | N/A    | 00842     | 09-JUN-2005 |
| 10X160US PLUGIN MODULE                  | 10X160US PLUGIN | C-S     | N/A    | 00843     | 09-JUN-2005 |
| 10X560US PLUGIN MODULE                  | 10X560US PLUGIN | C-S     | N/A    | 00841     | 09-JUN-2005 |
| 10x700uS PLUGIN MODULE w/ EXTENSION BOX | 10x700uS PLUGIN | C-S     | N/A    | 00844/845 | 23-JUN-2005 |
| PSURGE CONTROLLER MODULE                | PSURGE 8000     | HAEFELY | 150267 | 00879     | 11-JUN-2005 |
| COUPLING/DECOPUPLING MODULE             | PSD 900         | HAEFELY | 149213 | 00880     | 11-JUN-2005 |
| IMPULSE MODULE                          | PIM 900         | HAEFELY | 149202 | 00881     | 11-JUN-2005 |
| HIGH VOLTAGE CAP Nwk 5kVDC, 18μF        | CS-HVCC         | C-S     | 01     | 00772     | 28-SEP-2006 |
| NEBS SURGE GENERATOR                    | N/A             | C-S     | N/A    | 00088     | 17-JUN-2005 |
| 2X10uS SURGE GENERATOR                  | 2X10uS          | C-S     | N/A    | 00846     | 23-JUN-2005 |
| 10X700uS SURGE GENERATOR                | 10X700uS        | C-S     | N/A    | 00847     | 17-JUN-2005 |
| 12 PAIR SURGE RESISTOR MODULE           | N/A             | C-S     | N/A    | 00768     | 28-SEP-2005 |

| <b>POWER SUPPLIES</b>   | <b>MN</b> | <b>MFR</b>             | <b>SN</b>       | <b>ASSET</b> | <b>CALIBRATION DUE</b> |
|-------------------------|-----------|------------------------|-----------------|--------------|------------------------|
| 10001/2 AC POWER SYSTEM | (2) 500I  | CALIFORNIA INSTRUMENTS | HK53687/HK53688 | 00376        | 16-JUL-2005            |

| <b>POWER/NOISE METERS</b>        | <b>MN</b> | <b>MFR</b>    | <b>SN</b>  | <b>ASSET</b> | <b>CALIBRATION DUE</b> |
|----------------------------------|-----------|---------------|------------|--------------|------------------------|
| POWER METER                      | 435B      | HP            | 2445A11012 | 00773        | 07-APR-2005            |
| POWER METER                      | 437B      | HP            | 2912A01367 | 01099        | 27-OCT-2005            |
| POWER SENSOR                     | 8481A     | HP            | 2702A61351 | 00774        | 07-APR-2005            |
| PSOPHOMETER                      | 2429      | BRUEL & KJAER | 1237642    | 00585        | 18-FEB-2005            |
| TRANSMISSION LINE TESTER (dBRNC) | 185T      | AMREL         | 998658     | 00823        | 08-MAR-2005            |

| <b>OVERVOLTAGE CHAMBERS</b> | <b>MN</b> | <b>MFR</b> | <b>SN</b> | <b>ASSET</b> | <b>CALIBRATION DUE</b> |
|-----------------------------|-----------|------------|-----------|--------------|------------------------|
| 72kW POWER FAULT SIMULATOR  | OV1       | C-S        | N/A       | 00792        | 31-MAR-2005            |
| POWER FAULT SIMULATOR       | OV2       | C-S        | N/A       | 00116        | 31-MAR-2005            |

| <b>DIPOLE TAPE MEASURES</b> | <b>MN</b> | <b>MFR</b> | <b>SN</b> | <b>ASSET</b> | <b>CALIBRATION DUE</b> |
|-----------------------------|-----------|------------|-----------|--------------|------------------------|
| 26FT TAPE #1                | 2338CME   | LUFKIN     | C3166-1   | 00776        | 26-FEB-2005            |
| 26FT TAPE #2                | 2338CME   | LUFKIN     | C3166-2   | 00777        | 26-FEB-2005            |

| <b>METEOROLOGICAL METERS</b>       | <b>MN</b>          | <b>MFR</b> | <b>SN</b> | <b>ASSET</b> | <b>CALIBRATION DUE</b> |
|------------------------------------|--------------------|------------|-----------|--------------|------------------------|
| TEMP./HUMIDITY/ATM. PRESSURE GAUGE | 7400 PERCEPTION II | DAVIS      | N/A       | 00965        | 19-JAN-2005            |
| TEMPERATURE /HUMIDITY GAUGE        | THG-912            | HUGER      | 4000562   | 00789        | 08-JAN-2005            |

| <b>TRACEABLE CLOCKS</b> | <b>MN</b> | <b>MFR</b>      | <b>SN</b> | <b>ASSET</b> | <b>CALIBRATION DUE</b> |
|-------------------------|-----------|-----------------|-----------|--------------|------------------------|
| 5003                    | 5003      | CONTROL COMPANY | 99026940  | 00808        | 09-DEC-2004            |

| <b>CONSUMABLES</b> | <b>SPEC.</b>        | <b>MFR</b> | <b>STOCK/MN</b> | <b>ASSET</b> | <b>CALIBRATION DUE</b> |
|--------------------|---------------------|------------|-----------------|--------------|------------------------|
| NEBS CHEESECLOTH   | 26-28M/KG           | ED&D       | ACC-01          | N/A          | N/A                    |
| NEBS CARBON BLOCK  | 3-MIL-GAP 1kV SURGE | RELIABLE   | 3AB             | N/A          | N/A                    |

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

## ***Terms And Conditions***

### **Paragraph 1. SERVICES.** LABORATORY will:

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

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

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

### **Paragraph 3. GENERAL CONDITIONS:**

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

### **Paragraph 4. INSURANCE:**

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

**Paragraph 5. PAYMENT:**

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

**Paragraph 6. ISO/IEC GUIDE 17025 ADDITIONS:**

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

## *A2LA Accreditation*

|   |  |  |   |   |
|---|--|--|---|---|
| <b>SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999</b>   |  | <b>EN 55011 1991, 1998</b><br><b>SABS CISPR 11:1997</b><br><b>Canada ICES-001 1998</b><br><b>CNSI 3803</b><br><b>AS/NZS 2064: 1997</b><br><b>CSA C108.8 – M1983</b><br><b>CISPR 13:1996, 1998, 2001</b><br><b>EN 55013: 1990, 2001</b><br><b>EN 55013 Amend 12 1994</b><br><b>SABS CISPR 13: 1996</b><br><b>CNS 13439</b><br><b>AS/NZS 1053: 1999</b><br><b>CISPR 14 1993</b><br><i>(except discontinuous disturbances)</i><br><b>for</b><br><b>EN 55014 1993, 1997</b><br><i>(discontinuous disturbances)</i><br><b>for</b><br><b>AS/NZS 1044: 1995</b><br><i>(discontinuous disturbances)</i><br><b>for</b><br><b>Immunity</b><br><b>CNSI 3783-1</b><br><b>SABS CISPR 14-1 1993</b><br><b>SABS CISPR 14-2 1997 + A1:2001</b><br><b>(A2LA Cert. No. 1627-01) 10/31/03</b><br><b>Page 1 of 11</b><br><b>(A2LA Cert. No. 1627-01) 10/31/03</b><br><b>Page 2 of 11</b> |   |   |
| <b>CURTIS-STRAUSS<sup>1</sup></b><br>527 Great Road<br>Littleton, MA 01460<br>Barry Quinlan Phone: 978-486-8880<br><b>ELECTRICAL</b>  | <b>Valid until: July 31, 2005</b><br><b>Certificate Number: 1627-01</b><br>In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following <u>Electromagnetic Compatibility (EMC)</u> , <u>Telecommunications</u> , and <u>Product Safety tests</u> :   | <b>EN 55022 1997 with amendments 1 and 2</b><br><b>CNS13438 1994</b><br><b>EN55022:1994 and 1998</b><br><b>SABS CISPR 22:1997</b><br><b>Canada ICES-003 1997</b><br><b>AS/NZS 3548 1995</b><br><b>information</b><br><b>CISPR 11 1990, 1997, 1999</b>  | <b>Electromagnetic Compatibility (EMC)</b><br>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   |   |
| <b>EMC Standards</b><br><b>Emissions</b><br><b>CISPR 22 1997 with amendments 1 and 2</b><br><b>CNS13438 1994</b><br><b>EN55022:1994 and 1998</b><br><b>SABS CISPR 22:1997</b><br><b>Canada ICES-003 1997</b><br><b>AS/NZS 3548 1995</b><br><b>information</b><br><b>CISPR 11 1990, 1997, 1999</b> | <b>Title</b><br>Limits and methods of measurement of radio disturbance characteristics of information technology equipment.<br>Limits and methods of measurement of radio interference characteristics of information technology equipment.<br>Limits and methods of measurement of radio disturbance characteristics of information technology equipment.<br>Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement<br>Digital apparatus<br>Australian/New Zealand Standard Limits and methods of measurement of radio disturbance characteristics of technology equipment<br>Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment. | <b>EN 55022 1997 + A1:2001</b><br><b>CISPR 20: 1995, 2002 with amendment 3 characteristics (associated group only)</b><br><b>EN 55020: 1995, 2002 (associated group only)</b><br><b>CISPR 24</b><br><b>–</b><br><b>SABS CISPR 24 1997</b><br><b>–</b><br><b>AS/NZS 3200.1.2: 1995</b>  | <b>1</b> Note: This accreditation covers testing performed at the laboratory listed above and the satellite facility located at 168 Ayer Rd, Littleton, MA 01460  |   |
| <b>(A2LA Cert. No. 1627-01) 10/31/03</b><br><b>11</b>   | <b>Page 1 of</b><br><b>EN 61000-6-1: 1997, 2001</b><br><b>EN 61000-6-2: 1998, 2001</b><br><b>EN 50091-2 1996</b><br><b>EN 55024 1998</b><br><b>Limits</b><br><b>EN 55103-1 1997</b><br><b>EN 55103-2 1997 (excluding Annex A3)</b><br><b>use.</b><br><b>EN 61326 1998</b><br><b>EN 61547 1996</b><br><b>EN 50130-4 1996</b><br><b>family</b><br><b>EN 55104 1995</b><br><b>household</b><br><b>EN 50083-2 1995</b><br><b>EN 60601-1-2: 1993, 2002</b><br><b>IEC 1800-3 1995</b><br><b>product</b><br><b>EN 60555 Part 2 1987</b><br><b>EN 60555 Part 3 1987</b><br><b>EN 61000-3-2: 1995, 2000</b><br><b>Limits AS/NZS 61000.3.2 1998</b><br><b>EN 61000-3-3 1995</b><br><b>AS/NZS 61000.3.3 1999</b><br><b>ETS 300 386-1 1994</b>   | <b>EN 61000-6-1: 1997, 2001</b><br><b>EN 61000-6-2: 1998, 2001</b><br><b>EN 50091-2 1996</b><br><b>EN 55024 1998</b><br><b>EN 55103-1 1997</b><br><b>EN 55103-2 1997 (excluding Annex A3)</b><br><b>use.</b><br><b>EN 61326 1998</b><br><b>EN 61547 1996</b><br><b>EN 50130-4 1996</b><br><b>family</b><br><b>EN 55104 1995</b><br><b>household</b><br><b>EN 50083-2 1995</b><br><b>EN 60601-1-2: 1993, 2002</b><br><b>IEC 1800-3 1995</b><br><b>product</b><br><b>EN 60555 Part 2 1987</b><br><b>EN 60555 Part 3 1987</b><br><b>EN 61000-3-2: 1995, 2000</b><br><b>Limits AS/NZS 61000.3.2 1998</b><br><b>EN 61000-3-3 1995</b><br><b>AS/NZS 61000.3.3 1999</b><br><b>ETS 300 386-1 1994</b>  | <b>Electromagnetic Compatibility (EMC)- Part 6: Generic standards-Section 1: Immunity for residential, commercial and light-industrial environments</b><br><b>Electromagnetic Compatibility (EMC)- Part 6: Generic standards-Section 2: Immunity for industrial environments</b><br><b>Specification for Uninterruptible Power Systems (UPS). Part 2: EMC requirements</b><br><b>Information technology equipment – Immunity Characteristics – and methods of measurement.</b><br><b>Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Part 1: Emission</b><br><b>Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control professional Part 2: Immunity</b><br><b>Electrical equipment for measurement, control and laboratory use – EMC requirements</b><br><b>Equipment for general lighting purposes – EMC immunity requirements</b><br><b>Alarm Systems. Part 4: Electromagnetic compatibility. Product standard: Immunity requirements for components of fire, intruder and social alarm systems.</b><br><b>Electromagnetic compatibility immunity – requirements for appliances, tools and similar apparatus. Product family standard. Cabled distribution systems for television and sound signals. Part 2: Electromagnetic compatibility for equipment.</b><br><b>Medical electrical equipment Part 1: general requirements for safety Section 2: Collateral standard: Electromagnetic compatibility – requirements and tests</b><br><b>Adjustable speed electrical power drive systems. Part 3: EMC standard including specific test methods.</b><br><b>Disturbances in supply systems caused by household appliances and similar electrical equipment. Part 2: Harmonics</b><br><b>Disturbances in supply systems caused by household appliances and similar electrical equipment. Part 3: Voltage fluctuations.</b><br><b>Electromagnetic compatibility (EMC). Part 3: Limits Section 2: for harmonic current emissions</b><br><b>Electromagnetic compatibility (EMC). Part 3: Limits Section 2: Limitation of voltage fluctuations and flicker in low-voltage supply systems.</b><br><b>Equipment Engineering (EE); Public telecommunication network equipment electro-magnetic compatibility (EMC) requirements Part 1: Product family overview, compliance criteria and test levels</b> |   |
| <b>European Union Basic EMC Standards</b><br><b>EN 61000-4-2: 1995, 1999, 2001</b>  | <b>EN 61000-4-3:1997, 1998, 2002</b><br><b>AS/NZS 61000.4.3 1999</b><br><b>EN 61000-4-4 1995</b><br><b>EN 61000-4-5 1995</b><br><b>AS/NZS 61000.4.5 1999</b><br><b>EN 61000-4-6 1996</b><br><b>AS/NZS 61000.4.6 1999</b><br><b>conducted</b><br><b>EN 61000-4-8 1994</b>   | <b>EN 61000-4-11 1994</b><br><b>11:</b><br><b>ENV 61000-2-2 1993</b>   | <b>EN 61000-4-2: 1995, 1999, 2001</b><br><b>EN 61000-4-3:1997, 1998, 2002</b><br><b>AS/NZS 61000.4.3 1999</b><br><b>EN 61000-4-4 1995</b><br><b>EN 61000-4-5 1995</b><br><b>AS/NZS 61000.4.5 1999</b><br><b>EN 61000-4-6 1996</b><br><b>AS/NZS 61000.4.6 1999</b><br><b>conducted</b><br><b>EN 61000-4-8 1994</b><br><b>EN 61000-4-11 1994</b><br><b>11:</b><br><b>ENV 61000-2-2 1993</b>   | <b>EN 61000-4-2: 1995, 1999, 2001</b><br><b>EN 61000-4-3:1997, 1998, 2002</b><br><b>AS/NZS 61000.4.3 1999</b><br><b>EN 61000-4-4 1995</b><br><b>EN 61000-4-5 1995</b><br><b>AS/NZS 61000.4.5 1999</b><br><b>EN 61000-4-6 1996</b><br><b>AS/NZS 61000.4.6 1999</b><br><b>conducted</b><br><b>EN 61000-4-8 1994</b><br><b>EN 61000-4-11 1994</b><br><b>11:</b><br><b>ENV 61000-2-2 1993</b> |
| <b>EU Product Family Standards</b><br><b>EN 50081-1 1992</b><br><b>1:</b><br><b>EN 50081-2 1993</b><br><b>Part</b><br><b>EN 50082-1 1992, 1998</b><br><b>Part</b><br><b>EN 50082-2 1995</b>   | <b>EN 50081-1 1992</b><br><b>1:</b><br><b>EN 50081-2 1993</b><br><b>Part</b><br><b>EN 50082-1 1992, 1998</b><br><b>Part</b><br><b>EN 50082-2 1995</b>  | <b>EN 50081-1 1992</b><br><b>1:</b><br><b>EN 50081-2 1993</b><br><b>Part</b><br><b>EN 50082-1 1992, 1998</b><br><b>Part</b><br><b>EN 50082-2 1995</b>  | <b>EN 50081-1 1992</b><br><b>1:</b><br><b>EN 50081-2 1993</b><br><b>Part</b><br><b>EN 50082-1 1992, 1998</b><br><b>Part</b><br><b>EN 50082-2 1995</b>   |   |
| <b>(A2LA Cert. No. 1627-01) 10/31/03</b>  | <b>Page 3 of 11</b>  | <b>(A2LA Cert. No. 1627-01) 10/31/03</b>   | <b>Page 4 of 11</b>   |   |

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|--|--|---|--|
| ETS EN 300 386-2 1997, 1998,<br>ETS EN 300 386 2000 v1.2.1, 2001 v1.3.1              | Electromagnetic compatibility and radio spectrum matters (ERM); Telecommunication network equipment; Electromagnetic compatibility (EMC) requirements; Part 2: Product family standard.  | EN 300 328-2:2001 v1.2.1  | Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband Transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using spread spectrum modulation techniques; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive   |
| ETS 300 132-1 1996   | Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 1: Operated by alternating current (ac) derived from direct current (dc) sources   | EN 301 489-1:2002   | Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements   |
| ETS 300 132-2 1996   | Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc)   | EN 60669-2-1:2002   | Switches for household and similar fixed electrical installations -- Part 2-1: Particular requirements -- Electronic switches  |
| ETR 283 1997   | Equipment Engineering (EE); Transient voltages at Interface A on telecommunications direct current (DC) power distributions.   | <i>Canada Radio Standards</i><br>Canadian GL-36 1995  |  |
| <i>EU radio standards</i><br>(ETSI) EN 300 385 v1.2.1: 1998, 1999                    | Electromagnetic compatibility and Radio spectrum matters (ERM); Electromagnetic Compatibility (EMC) standard for fixed radio links and ancillary equipment (ETSI)  | Canadian RSS-119 1999, 2000 Issue 6   | Industry Canada – technical requirements for low power Devices in the 2400 – 2483.5 MHz band.  |
| EN 300 330 v1.2.1: 1998, 1999  | Electromagnetic compatibility and Radio spectrum matters (ERM); Short range devices (SRD); Technical characteristics and test methods for radio equipment in the range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz   | Canadian RSS-134 1996 & 2000, Issue 1 Rev 1   | Industry Canada – Land mobile and fixed radio Transmitters and receivers, 27.41 to 960.0 MHz   |
| ETS 300 328 1996   | Radio Equipment and Systems (RES); Wideband transmission systems; Technical characteristics and test conditions for data transmission equipment operating in the 2,4 GHz ISM band and using spread spectrum modulation techniques  | Canadian RSS-210 2000 Issue 3,  | Industry Canada – 900 MHz narrowband personal communications services  |
| ETS EN 300 440 v1.2.1 1999   | Electromagnetic compatibility and Radio spectrum matters (ERM); Short range devices; Technical characteristics and test methods for radio equipment to be used in the 1 GHz to 40 GHz frequency range  | RFS29 1998  | Industry Canada – Low power license-exempt radio 2001 Issue 5 communication devices  |
| EN 301 893:2002 v1.2.1   | Broadband Radio Access Networks (BRAN); 5 GHz (draft) high performance RLAN; Harmonized EN covering Essential requirements of article 3.2 of the R&TTE Directive   | 47 CFR FCC low power transmitters operating on frequencies below 1 GHz, emergency alert systems, unintentional radiators and ISM devices. | Specification for Restricted Radiation Radio Apparatus (New Zealand)   |
| ETS 300 836-1:1998   | Broadband Radio Access Networks (BRAN); High Performance Radio Local Area Network (HIPERLAN) Type 1, Conformance testing specification; Part 1: Radio Type approval and Radio Frequency (RF) conformance test specification  | 47 CFR FCC low power transmitters operating on frequencies above 1 GHz, with the exception of spread spectrum devices.                    | Scope A1   |
| EN301 489-17:2002 v1.2.1   | Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for 2,4 GHz wideband transmission systems and 5 GHz high performance RLAN equipment  | 47 CFR FCC Unlicensed Personal Scope<br>Communications System (PCS) devices   | Scope A2   |
|  |  | 47 CFR FCC Unlicensed National Scope  |  |
|  |  | Information Infrastructure devices and low power transmitters using spread spectrum techniques.   |  |
|  |  | 47 CFR FCC Personal mobile Scope<br>Radio Services in the following FCC Rule Parts 22, 24, 25, 27.  | A3   |
|  |  | 47 CFR FCC General Mobile Radio Scope Services in the following FCC Rule Parts 22, 74, 90, 95, 97.  | B1   |
|  |  | 47 CFR FCC Maritime and Aviation Scope RadioServices in 47 CFR Parts 80 and 87  | B2   |
|  |  | 47 CFR FCC Microwave Radio Services   | B3   |
|  |  | Scope in 47 CFR Parts 21, 74 and 101.   | B4   |
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| FCC/OST MP-5 1986  | FCC (Federal Communications Commission) methods Of measurement of radio noise emissions from industrial, scientific and medical equipment.   | TIA/EIA-IS-968  | Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network   |
| GR-1089-CORE: 1997, 1999 issue 2/ 2002 Issue 3                                       | Bellcore electromagnetic compatibility and electrical safety – Generic criteria for network telecommunications equipment.  | TIA/EIA-IS-883  | Telecommunications Telephone Terminal Equipment Supplemental Technical Requirements for Connection of Stutter Dial Tone Detection Devices and ADSL Modems to the Telephone Network   |
| <i>ANSI EMC Standards</i><br>ANSI C63.4: 1992, 1999, 2001, 2003                      | American National Standard for methods of measurement of radio-noise emissions for low-voltage electrical and electronic equipment in the range of 9 kHz to 40GHz.   | TIA-968-A   | Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network   |
| ANSI C63.5 1988  | American National Standard for electromagnetic compatibility – radiated emissions measurements in electromagnetic interference (EMI) control – calibration of antennas.  | T1.TRQ-6-2001   | Technical Requirements for SHDSL, HDSL2, HDSL4 Digital Subscriber Line Terminal Equipment to Prevent Harm to the Telephone Network Industry  |
| <i>IEEE EMC Standards</i><br>IEEE C62.41: 1980, 1991                                 | IEEE recommended practice on surge voltages in low-voltage AC power circuits   | Canada VDSL<br>Issue 1 January 2003   | Terminal Attachment Program Requirements and Test Methods for Very-High-Bit-Rate Digital Subscriber Line (VDSL) Terminal Equipment   |
| <i>Swedish EMC Standards</i><br>BAKOM 3336.3 1995                                    | Electromagnetic compatibility and electrical safety (EMC & S) for wired terminal equipment. Harmonization document information over the OFCOM requirements.  | AS/ACIF S002-2001   | Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network   |
| <i>South African EMC standards other than CISPR equivalents</i><br>SABS 1718-1: 1996 | South African Bureau of Standards: Specification for Gaming equipment. Part 1: Casino equipment.   | AS/ACIF S016-2001   | Requirements for Customer Equipment for connection to hierarchical digital interfaces  |
| <i>Japanese VCCI Standards</i><br>VCCI V-3/99.05 1999<br>VCCI V-4/99.05 1999         | Technical Requirements<br>Instruction for Test Conditions for Requirement under Test   | AS/ACIF S031-2001<br>AS/ACIF S038-2001<br>AS/ACIF S043-2001   | Requirements for ISDN Basic Access Interface<br>Requirements for ISDN Primary Rate Access Interface<br>Requirements for Customer Equipment for Connection to a Metallic Local Loop Interface of a Telecommunications Network – Part 1: General<br>Part 2: Broadband  |
| <i>Telecommunications</i>  | Telecommunications Registration; General test methods; Lightning surge; Drop testing; Balance testing; Signal power (metallic and longitudinal); Frequency measurements; Pulse templates; Leakage testing; Impedance testing; Hearing Aid Compatibility testing ( <i>excluding volume control</i> ); Protocol analysis and Jitter testing. | ITU-T G.703<br>HKTA 2028  | Part 3: DC, Low Frequency AC and Voiceband<br>Physical/electrical characteristics of hierarchical Digital interfaces   |
| <i>Telecom Standards</i>   | <i>Title</i>   | HKTA 2029   | Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 1544 kbit/s  |
| FCC 47 CFR Part 68 Telephone   | Connection of terminal equipment to the telephone Terminal Equipment network. Analog and Digital Equipment. TCB Scope C1.  | TBR 1 : 1995  | Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 2048 kbit/s  |
| CS-03 Issue 8 1996 through amendment 5   | Specification for terminal equipment, terminal systems, Network protection devices, connection arrangements and hearing aids compatibility.  | TBR 2 : 1997  | Attachment requirements for terminal equipment to be connected to circuit switched data networks and leased circuits using a CCITT Recommendation X.21 interface, or at an interface physically, functionally and electrically compatible with CCITT Recommendation X.21 but operating at any data signaling rate up to, and including, 1 984 kbit/s |
| TIA/EIA TSB31-B 1998   | Bulletin Part 68 Rationale and Measurement Guidelines (Feb 1998)   |   | Attachment requirements for Data Terminal Equipment (DTE) to connect to Packet Switched Public Data Networks (PSPDNs) for CCITT Recommendation X.25 interfaces at data signaling rates up to 1 920 kbit/s utilizing interfaces derived from CCITT Recommendations X.21 and X.21 bit  |
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| TBR 3 : 1995 + Amdt : 1997  | Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access   | IEC 60950 2000<br>EN 60950 1997, 1998, 2000<br>IEC 60950-1 2001<br>UL 60950-1 2003<br>CSA C22.2 No. 60950-1 03<br>AS/NZS 3260 1993<br>AS/NZS 3260 Supp 1 1996<br>ACA TS 001 1997   | Safety of information technology equipment<br>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  | Approval and test specification – Safety of information technology equipment including electrical business Equipment.  |  |
| 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   | 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)<br>Australian Communications Authority – Safety requirements for customer equipment. |  |
| TBR 013 : 1996  | Business Telecommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Attachment requirements for terminal equipment interface   | Telephone Equipment  |  |
| TBR 21 : 1998   | Terminal Equipment (TE); Attachment requirements for pan-European approval for connection to the analogue Public Switched Telephone Networks (PSTNs) of TE (excluding TE supporting the voice telephony service) in which network addressing, if provided, is by means of Dual Tone Multi Frequency (DTMF) signaling | 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  | Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements.  |  |
| <i>Australia</i>  |  | Electrical equipment for laboratory use Part 1: General requirements.  |  |
| 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   |  |  |
| TS 031 : 1997   | Requirements for ISDN Basic Access Interface   |  |  |
| TS 038 : 1997   | Requirements for ISDN Primary Rate Access Interface  |  |  |
| AS/ACIF S043.2:2001   | Requirements for Customer Equipment for connection to a metallic loop interface of a Telecommunications Network – Part 2 Broadband   |  |  |
| <b>Product Safety</b>   |  |  |  |
| 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> ). |  |  |  |
| <b>Product Safety Standards</b>   | <b>Title</b>   |  |  |
| Specific Product Safety Standards   |  |  |  |
| IEC 950 1991  | Safety of information technology equipment including Includes Amendments 1, 2, 3, and 4 electrical business equipment.   | Medical electrical equipment. Part 1: General requirements for safety.   |  |
| UL 1950 1998  | Safety of information technology equipment, including electrical business equipment.   | Medical electrical equipment. Part 1: General Requirements for safety.   |  |
| CSA C22.2 No.950-95   | Safety of Information Technology Equipment (UL 1950)   | Audio, video and similar electronic apparatus – Safety requirements  |  |
| UL 60950 2000   | Safety of information technology equipment   | Audio/video and musical instrument apparatus for Household, commercial and similar general use   |  |
| (A2LA Cert. No. 1627-01) 10/31/03   | Page 9 of 11   | Australian/New Zealand Standard – Approval and test Specification – Mains operated electronic and related Equipment for household and similar general use  |  |
|   |  | Audio, video and similar electronic equipment. Consumer and 1994, commercial products  |  |
|   |  | Safety requirements for main operated electronic and related apparatus for household and similar general use.  |  |
|   |  | Radiation safety of laser products, equipment Classification, requirements and user's guide  |  |
|   |  | Safety of laser products Part 1: equipment Classification, requirements and user's guide.  |  |
|   |  | Safety of laser products – Part 2: Safety of optical communication   |  |
|   |  | IEC 60601-1 1995<br>EN 60601-1 1995 ( <i>Including AM 2</i> )<br>UL 2601-1 1997<br>IEC 60065 1998, 2000<br>ANSI/UL 6500: 1998<br>CAN/CSA 60065-00<br>AS/NZS 3250 1995<br>AS/NZS 60065 2000   |  |
|   |  | Canadian C22.2 No. 1-94 (1-98)<br>1998<br>EN 60065 1994  |  |
|   |  | IEC 60825 1990<br>EN 60825-1 1994<br>IEC 60825-1 2001<br>IEC 60825-2 2000-5<br>systems   |  |
|   |  | IEC 60825-4 1997-11<br>IEC 60335-1 1995<br>( <i>Including AM2 – 1997 &amp; AM 12 – 1997</i> ) Part 1: General requirements   |  |
|   |  | EN 60335-1 2001<br>UL 60335-1 1998<br>CAN/CSA E335-1 1994  |  |
|   |  | Safety of laser products – Part 4: Laser guards  |  |
|   |  | Safety of household and similar electrical appliances  |  |
| <b>Environmental</b> <sup>2</sup>   | <b>Title</b>   |  |  |
| <b>Environmental Standards</b>  |  |  |  |
| GR-63-CORE  | NEBS Requirements: Physical Protection   |  |  |
| ETS 300 019   | Environmental conditions and environmental tests For telecommunications equipment  |  |  |
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<sup>2</sup> Environmental testing is performed at the satellite facility located at 168 Ayer Rd, Littleton, MA 01460