Curtis-Straus Test Report

Report No	EH0614-1
Client	Thing Magic 1 Broadway, 5th Floor Cambridge, MA 02142
Phone	617-758-4130
Fax	617-225-4410
FRN	0008403743
Model	M4
FCC ID	QV5MERCURY4
IC ID	5407A-MERCURY4
Equipment Type	Spread Spectrum Transmitter
Equipment Code	DSS
Emission Designator	250KA1D
Results	As detailed within this report
Prepared by	Mairaj Hussain – Test Engineer
Authorized by	Michael Buchholz – EMC Manager
Issue Date	5/29/07
Conditions of issue	This Test Report is issued subject to the conditions stated in 'terms and conditions' section of this report.

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

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Summary

This test report supports an application for class II permissive change for a transmitter operating under 47 CFR 15.247 and RSS210 Issue 6. The product is the Thing Magic M4 RF ID reader. It is a frequency hopper that operates in the range 902.7 – 927.25MHz. It utilizes a hopping table of 50 channels between channel 0 (902.7MHz) and channel 50 (927.25MHz) inclusively.

Class II permissive change is requested because Thing Magic intends to use the following new antenna with the product.

Manufacturer:	Cushcraft
Model #:	S9028PCRJ
Model #:	S9028PCLJ
Gain:	6dBi
Frequency Range:	902 – 928MHz

The "L" and "R" in the antenna part number only refer to the "handedness" of the circular polarization. The remaining specifications are identical for the two models.
Please note that antenna gain of the new antennas is same as the original antennas submitted with application, therefore a new MPE calculation was not performed.

Test Methodology

Testing is performed according to the procedures specified in ANSI C63.4 (2003). All testing was performed on a non conductive 80cm high table. Radiated spurious emissions were checked in restricted band around antenna pass band and up to 10th harmonic of the highest operating channel.

Frequency range investigated: 800MHz – 10GHz

Frequency Range	Distance
900MHz – 10GHz	3 m

The system employs 2 different cable lengths 6ft and 25ft. Output power is set to 30.9dBm and 32.5dBm for 6ft and 25ft cables respectively. To represent the worst case conditions, shortest length cable (6ft) with highest power setting (32.5dBm) was used.

Emissions from the product were maximized by rotating the product and antennas. Peak and average readings were taken. If peak reading passed the average limits by more than 3db then average readings was not taken.

EUT Configuration

EUT Configuration

Work Order: H0614
Company: Thing Magic
Company Address: 1 Broadway 5th Floor
Cambridge, MA 02142
Contact: Paul Franzosa
Person Present: John Riley

	MN	SN
EUT:	Mercury 4	Sample 1
EUT Description:	RF ID Reader	
EUT Max Frequency:	902.75MHz	

Support Equipment:	MN	SN
Toshiba laptop	1805-5207	22021825PU
EDA AC adapter	EA10603B	sample 1

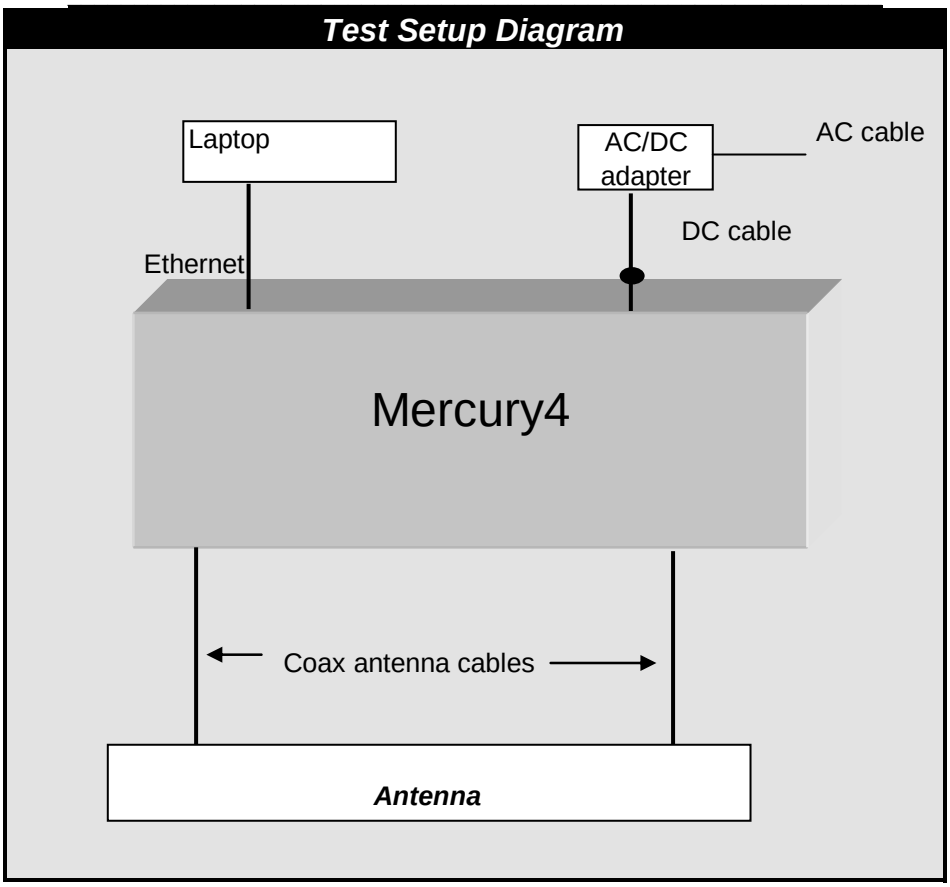
EUT Cables:	Qty	Shielded?	Length	Ferrites
Tx (coax)	1	Yes	25 ft and 6 ft	None
Rx (coax)	1	Yes	25 ft and 6 ft	None
DC power	1	No	3 ft	One
AC power	1	No	3 ft	None
Ethernet 1	1	No	6 ft	None

Unpopulated EUT Ports:	Qty	Reason
Rx ports	3	Redundant
Tx ports	3	Redundant
dB-9	1	Setup and diagnostic

Software / Operating Mode Description:

Transmitting on either first, middle or last channel.

Test Setup Diagram



Radiated Spurious Emissions

LIMITS

"…radiated emissions which fall in the restricted bands, as defined in §15.209(a), must also comply with the radiated emission limits specified in §15.209(a)" [15.247(c)] Furthermore, "...*in any 100KHz band outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be 20dB below that in any 100KHz bandwidth within the band that contains the highest level of desired power, based on RF conducted or radiated measurement" [15.247(d)]*

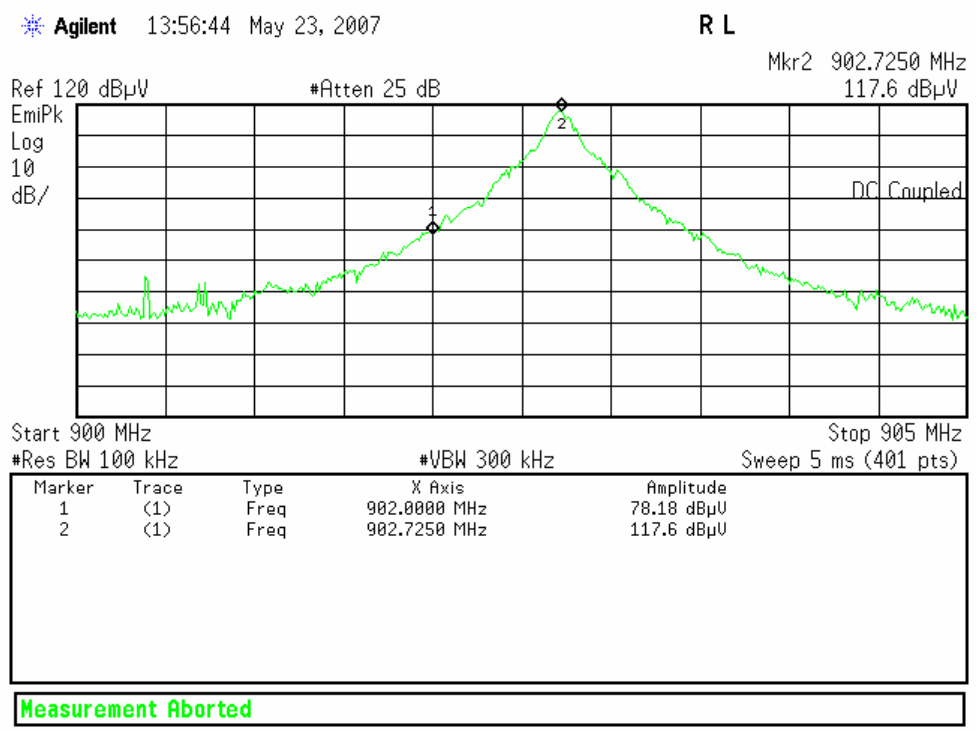
MEASUREMENTS

The EUT was tested with the output at the port set to its highest power level 32.5dB, using the 6ft cable and a 6dBi antenna. This configuration would yield the highest spurious emissions outside the pass band 902 -928MHz.

Plots below show compliance with band edge requirement.

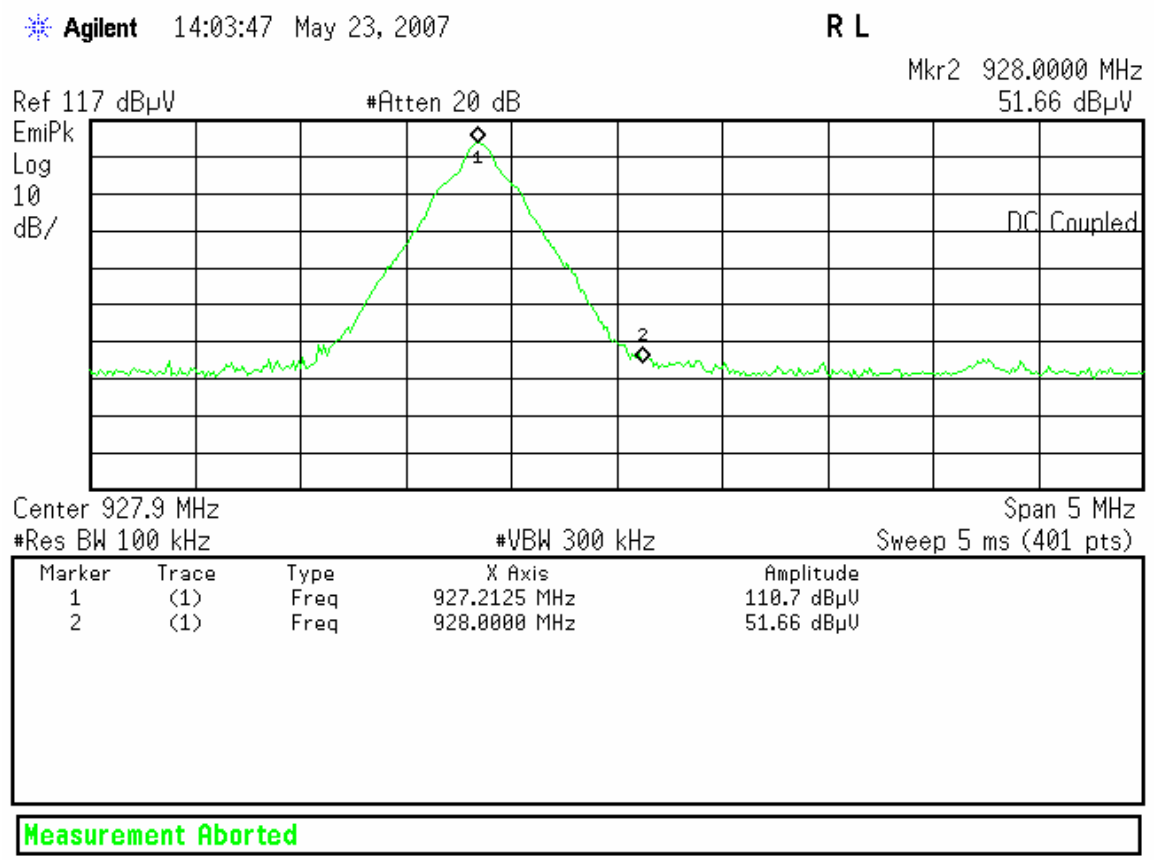
Antenna : S9028PCRJ

Operating at first channel



Emission at the band edge is more than 20dB smaller than the peak of fundamental.

Operating at last channel



Emission at the band edge is more than 20dB smaller than the peak of fundamental.

Table 1

Radiated Emissions Table — *Curtis-Straus LLC*

Date: 23-May-07 **Company:** Thing Magic **Work Order:** H0614
Engineer: Mairaj Hussain **EUT Desc:** M4 with S9028PCRJ and S9028PCLJ

Frequency Range: 900 - 1000MHz **Measurement Distance:** 3 m
Notes: Running at max powe with 6ft antenna cables **EUT Max Freq:** 927.3MHz

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	--- Limit (dBµV/m)	--- Margin (dB)	--- Result (Pass/Fail)	FCC Class B Limit (dBµV/m)	FCC Class B Margin (dB)	FCC Class B Result (Pass/Fail)
At channel 902.7MHz												
Hpk	960.0	30.4	24.9	23.4	7.6	36.5				46.0	-9.5	Pass
At channel 927.25MHz												
Hpk	960.0	31.0	24.9	23.4	7.6	37.1				46.0	-8.9	Pass

Table Result: Pass by -8.9 dB ***Worst Freq:*** 960.0 MHz

Test Site: "A" **Pre-Amp:** Red **Cable:** EMIR-09 **Analyzer:** E7405A **Antenna:** Red-White

Table 2

Radiated Emissions Table — *Curtis-Straus LLC*

Date: 23-May-07 **Company:** Thing Magic **Work Order:** H0614
Engineer: Mairaj Hussain **EUT Desc:** M4 with S9028PCRJ and S9028PCLJ

Frequency Range: 1 - 10GHz **Measurement Distance:** 3 m
Notes: Check harmonics in restricted band **EUT Max Freq:** 927.25MHz

Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	FCC Class B Limit (dBµV/m)	FCC Class B Margin (dB)	FCC Class B Result (Pass/Fail)
At 927.3MHz									
Vpk	2781.6	54.1	42.5	31.1	1.3	44.0	54.0	-10.0	Pass
Vpk	3709.0	52.8	41.6	33.5	1.5	46.2	54.0	-7.8	Pass
Vpk	4635.7	54.8	41.0	34.8	1.7	50.3	54.0	-3.7	Pass
At 915.22MHz									
Hpk	4576.2	61.4	41.1	34.6	1.7	56.6	74.0	-17.4	Pass
Havg	4576.2	57.8	41.1	34.6	1.7	53.0	54.0	-1.0	Pass
Hpk	3661.0	52.7	41.8	33.4	1.5	45.8	54.0	-8.2	Pass
Vpk	2745.7	60.7	42.3	31.0	1.3	50.7	74.0	-23.3	Pass
Vavg	2745.7	59.1	42.3	31.0	1.3	49.1	54.0	-4.9	Pass
At 902.7MHz									
Vpk	2708.1	60.2	42.4	30.9	1.3	50.0	54.0	-4.0	Pass
Vpk	3611.1	54.7	41.8	33.2	1.5	47.6	54.0	-6.4	Pass
Vpk	4513.5	66.2	41.0	34.4	1.7	61.3	74.0	-12.7	Pass
Vavg	4513.5	56.0	41.0	34.4	1.7	51.1	54.0	-2.9	Pass
Vpk	5416.0	50.6	40.6	36.7	1.9	48.6	54.0	-5.4	Pass

Table Result: Pass by -1.0 dB ***Worst Freq:*** 4576.2 MHz

Test Site: "A" **Pre-Amp:** Red-Greer **Cable:** EMIR-HIGH-21 **Analyzer:** --- **Antenna:** Black Horn

Test Equipment Used

REV. 21-MAY-2007

SPECTRUM ANALYZERS / RECEIVERS	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
RED	9kHz-1.8GHz	8591E	Agilent	3441A03559	00024	I	08-JAN-2008
WHITE	9kHz-22GHz	8593E	Agilent	3547U01252	00022	I	06-OCT-2007
BLUE	9kHz-1.8GHz	8591E	Agilent	3223A00227	00070	I	18-DEC-2007
YELLOW	9kHz-2.9GHz	8594E	Agilent	3523A01958	00100	I	05-JUN-2007
GREEN	9kHz-26.5GHz	8593E	Agilent	3829A03618	00143	I	05-SEP-2007
BLACK	9kHz-12.8GHz	8596E	Agilent	3710A00944	00337	I	08-DEC-2007
TELECOM 3585A	20Hz-40.0MHz	3585A	Agilent	2504A05219	00030	I	15-FEB-2008
TELECOM 3585A	20Hz-40.0MHz	3585A	Agilent	1750A03418	00558	I	Out of Service
TELECOM 3585A	20Hz-40.0MHz	3585A	Agilent	1750A02762	01067	I	Out of Service
ORANGE	9kHz-26.5GHz	E4407B	Agilent	US39440975	00394	I	Out of Service
BROWN (RENTAL)	9kHz-26.5GHz	E4407B	Agilent	SG44210511	Rental	I	01-FEB-2008
EMI TEST RECEIVER	20-1000MHz	ESVS30	R&S	827957/001	01098	I	27-OCT-2008
RENTAL 7405A	100Hz-26.5 GHz	E7405A	Agilent	MY44212795	Rental	I	28-DEC-2007

LISNS/MEASUREMENT PROBES	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
RED	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	956348	00753	II	05-JUN-2007
BLUE (DC)	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	956349	00752	II	05-JUN-2007
YELLOW-BLACK	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	984735	00248	II	05-JUN-2007
ORANGE	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	903707	00754	I	07-MAY-2008
GOLD (DC)	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	984734	00247	II	05-JUN-2007
BROWN	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	0411656	00986	II	05-JUN-2007
GREEN	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	0411657	00987	II	08-JUN-2007
YELLOW	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	0411658	1080	II	05-JUN-2007
WHITE-BLACK	10kHz-30MHz	8610-50-TS-100-N	SOLAR	972019	00678	I	17-MAY-2008
BLACK	10kHz-30MHz	8610-50-TS-100-N	SOLAR	972017	00675	I	18-MAY-2008
RED-BLACK	10kHz-30MHz	8610-50-TS-100-N	SOLAR	972016	00677	I	18-MAY-2008
BLUE-BLACK	10kHz-30MHz	8610-50-TS-100-N	SOLAR	972018	00676	I	17-MAY-2008
BLUE MONITORING PROBE	0.01-150MHz	91550-2	TEGAM	12350	00807	I	26-MAY-2007
YELLOW MONITORING PROBE	0.01-150MHz	91550-2	ETS	50972	00493	I	23-JAN-2008
GREEN CURRENT TRANSFORMER	40Hz-20MHz	150	PEARSON	10226	00793	I	19-APR-2009
BLUE CISPR LINE PROBE	150kHz-30MHz	N/A	C-S	N/A	00805	II	08-JUN-2007
BLACK CISPR LINE PROBE	150kHz-30MHz	N/A	C-S	N/A	1254	II	08-JUN-2007
CISPR TELCO VOLTAGE PROBE	10kHz-30MHz	CS A/C-10	C-S	CS01	00296	II	17-NOV-2007
CISPR 22 TELCO ISN	9kHz-30MHz	FCC-TLISN-T4	FISCHER	20115	00746	I	15-NOV-2007

OPEN AREA TEST SITES (OATS)	FCC CODE	IC CODE	VCCI CODE	CAT	CALIBRATION DUE
SITE F	93448	IC 2762A-1	R-1688	II	23-JUN-2008
SITE T	93448	IC 2762A-2	R-905	II	23-JUN-2008
SITE A	93448	IC 2762-A	R-903	II	20-JUN-2008
SITE M	93448	IC 2762-M	R-904	II	19-JUN-2008
SITE J	93448	IC 2762A-3	R-2377	II	12-APR-2008

CONDUCTED TEST SITES (MAINS / TELCO)	FCC CODE	IC CODE	VCCI CODE	CAT	CALIBRATION DUE
EMI 1	93448	N/A	C-1801, T-268	III	NA
EMI 2	93448	N/A	C-1802, T-269	III	NA
EMI 3	93448	N/A	C-1803, T-270	III	NA

MIXERS/DIPLEXERS	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
MIXER / HORN	26.5-40 GHz	11970A/28-442-6	HP/ATM	2332A01695/A046903-01	1087	I	23-AUG-2007
MIXER / HORN	26.5-40 GHz	11970A/28-442-6	HP/ATM	3003A07825/A046903-01	1086	I	19-SEP-2007
MIXER / HORN	40-60 GHz	M19HW/A	OML	U30110-1	00821	I	26-MAR-2009
MIXER	33-50 GHz	11970Q	HP	3003A03155	00104	I	08-NOV-2007
MIXER / HORN	50-75 GHz	11970V /QWH-VPRROO	HP/QUINSTAR	2521A01197/8794001	1179	I	15-NOV-2007
MIXER	75-110 GHz	11970W	HP	2521A01334	00105	I	22-NOV-2007
MIXER / HORN	60-90 GHz	M12HW/A	OML	E30110-1	00822	I	26-MAR-2009
MIXER / HORN	90-140 GHz	MO8HW/A	OML	F21206-1	00811	I	26-MAR-2009
MIXER / HORN	140-220 GHz	MO5HW/A	OML	G21206-1	00812	I	26-MAR-2009
DIPLEXER	40-220 GHz	DPL.26	OML	N/A	00813	I	26-MAR-2009

ABSORBING CLAMPS	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
FISCHER CLAMP	30-1000MHZ	F-201-23MM	FISCHER	10	00081	I	20-JAN-2008

HARMONIC & FLICKER ANALYZER	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
HFTS	HP6842A	HP	3531A-00169	00738	II	30-DEC-2007
10001I/2 AC POWER SYSTEM	(2) 500I	CALIFORNIA INSTRUMENTS	HK53687/HK53688	00376	II	09-JAN-2008

PREAMPS / ATTENUATORS / FILTERS	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
RED	0.009-2000MHZ	ZFL-1000-LN	C-S	N/A	00798	II	20-APR-2008
BLUE	0.009-2000MHZ	ZFL-1000-LN	C-S	N/A	00759	II	17-APR-2008
BLUE-BLACK	0.009-2000MHZ	ZFL-1000-LN	C-S	N/A	00800	II	18-JAN-2008
GREEN	0.009-2000MHZ	ZFL-1000-LN	C-S	N/A	00802	II	02-MAY-2008
BLACK	0.009-2000MHZ	ZFL-1000-LN	C-S	N/A	00799	II	20-JUL-2007
ORANGE	0.009-2000MHZ	ZFL-1000-LN	C-S	N/A	00765	II	02-MAY-2008
RED-WHITE	0.009-2000MHZ	ZFL-1000-LN	C-S	N/A	1258	II	08-MAY-2008
WHITE	1-20GHZ	SMC-12A	C-S	426643	00760	II	22-JUL-2007
BROWN	1-20GHZ	PM2-38-218-4R5-17-15-SFF	C-S	PL1655	1132	II	02-APR-2008
YELLOW-BLACK	1-20GHZ	SMC-12A	C-S	535055	00801	II	OUT OF SERVICE
RED-GREEN	1-20GHZ	PM2-38-218-4R5-17-15-SFF	C-S	N/A	1256	II	14-AUG-2007
RED-BLUE	1-20GHZ	PE2-38-218-4R5-17-15-SFF	C-S	PL3177	1257	II	19-APR-2008
HF (YELLOW)	18-26.5GHZ	AFS4-18002650-60-8P-4	C-S	467559	00758	II	23-AUG-2007
HIGH PASS FILTER	1-18 GHZ	SPA-F-55204	K&L	36	00817	II	05-JAN-2008
LOW PASS FILTER	1-9 GHZ	11SL10-4100/X4400-O/O	K&L	4	00816	II	05-JAN-2008
HF 20DB 50W ATTENUATOR	0.03-20 GHZ	PE 7019-20	PASTERNACK	01	00791	II	08-MAY-2009
HF 30DB 50W ATTENUATOR	0.03-20 GHZ	PE 7019-30	PASTERNACK	02	1168	II	08-MAY-2009
40DB 100W ATTENUATOR	0.09-4000MHZ	BW-40N100W+	MINI-CIRCUITS	V N014900638	1231	II	08-NOV-2007
LOW FREQ LPF	10-100KHZ	L200K1G1	MICROWAVE CIRCUITS	4460-01 DC0432	1019	II	OUT OF SERVICE
LOW FREQ LPF	10-100KHZ	L200K1G1	MICROWAVE CIRCUITS	4777-01 DC0434	1088	II	OUT OF SERVICE

ANTENNAS	RANGE	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
GREEN BILOG	30-2000MHZ	CBL6112B	CHASE	2742	00620	II	13-JAN-2008
GREEN-BLACK BILOG	30-2000MHZ	CBL6112B	CHASE	2412	00127	II	13-JAN-2008
GREEN-RED BILOG	30-2000MHZ	CBL6112B	CHASE	2435	00990	I	12-APR-2008
BLUE BILOG	30-1000MHZ	3143	EMCO	1271	00803	II	06-JUN-2007
GRAY BILOG	20-2000MHZ	3141	EMCO	9703-1038	00066	II	06-JUN-2007(EMI) / 04-FEB-2008(RFI2)
YELLOW-BLACK BILOG	20-2000MHZ	CBL6140A	CHASE	1112	00126	II	06-JUN-2007(EMI) /20-APR-2008(RFI)
RED-WHITE BILOG	30-2000MHZ	JB1	SUNOL	A091604-1	01105	I	07-NOV-2008
RED-BLACK BILOG	30-2000MHZ	JB1	SUNOL	A091604-2	01106	I	20-OCT-2008
RED-BROWN BILOG	30-2000MHZ	JB1	SUNOL	A0032406	1218	I	04-AUG-2008
YELLOW HORN	1-18GHZ	3115	EMCO	9608-4898	00037	I	27-MAY-2007(EMI)
BLACK HORN	1-18GHZ	3115	EMCO	9703-5148	00056	I	17-JUN-2007(EMI) / 17-MAY-2008 (RFI)
ORANGE HORN	1-18GHZ	3115	EMCO	0004-6123	00390	I	09-JUN-2007(EMI) / 17-MAY-2008 (RFI)
HF (WHITE) HORN	18-26.5GHZ	801-WLM	WAVELINE	00758	00758	I	26-AUG-2007
SMALL LOOP	10KHZ-30MHZ	PLA-130/A	ARA	1024	00755	I	22-FEB-2008
LARGE LOOP	20HZ-5MHZ	6511	EMCO	9704-1154	00067	I	23-JAN-2008
ACTIVE MONOPOLE	30HZ-30MHZ	3301B	EMCO	3824	00068	II	06-DEC-2007
INDUCTION COIL	50-60HZ	1000-4-8	C-S	N/A	00778	II	26-SEP-2007
ADJUSTABLE DIPOLE	30-1000MHZ	3121C	EMCO	1370	00757	I	26-OCT-2008
ADJUSTABLE DIPOLE	30-1000MHZ	3121C	EMCO	1371	00756	I	09-NOV-2008
RE101 LOOP SENSOR	30HZ-100KHZ	RE101-13.3CM	C-S	N/A	00818	II	22-MAR-2009
RS101 RADIATING LOOP	30HZ-100KHZ	RS101-12CM	C-S	N/A	00819	II	22-MAR-2009
RS101 LOOP SENSOR	30HZ-100KHZ	RS101-4CM	C-S	N/A	00820	II	22-MAR-2009

EFT	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
EFT DIRECT COUPLING CAP	N/A	C-S	01	00794	II	06-FEB-2008

ESD GENERATORS	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
GREEN	NSG435	SCHAFFNER	000839	00763	I	25-OCT-2007
RED	NSG435	SCHAFFNER	001625	00762	I	06-FEB-2008
YELLOW	930D	ETS	201	00673	I	18-AUG-2007

MULTIFUCTIONING SYSTEMS	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
BLUE BESTEMC-2	711-1100	SCHAFFNER	199824-002SC	00117	II	OUT FOR SERVICE
RED BESTEMC-2	711-1100	SCHAFFNER	200122-074SC	00623	II	13-APR-2008 (SURGE / EFT) / 17-APR-2008 (D+I)

Modula 6000	Modula 6000	Schaffner		Demo	II	09-JAN-2008 (Surge) / 10-JAN-2008 (EFT)
EMC PRO PLUS	EMCPRO Plus	Keytek	0608208	Rental	II	17-MAY-2008 (EFT)
EMC PRO	EMC PRO	Keytek	0005292	Rental	II	04-JAN-2008 (Surge) / 17-JAN-2008 (EFT)
USC 500-M	USC 500 M6B	Emtest	V0616101357	Demo	II	09-JAN-2008 (Surge)

Chambers and Stripline	MN	Mfr	SN	Asset	Cat	Calibration Due
RFI 1 Chamber	3 Meter Compact	Panashield	N/A	00797	II	20-APR-2008
RFI 2 Chamber	04' x 07' Shielding System	Lindgren	13329	00795	II	04-FEB-2008
RFI 3 Stripline	N/A	C-S	N/A	00796	III	NA
Environmental (Safety)	ECL5	B-M-A Inc.	2041	00029	I	03-JAN-2008
Environmental (Safety)	SGTH-31S	B-M-A Inc.	2245	00321	I	03-JAN-2008

Amplifiers	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Red	0.5-1000MHz	10W1000B	AR	18708	00032	II	28-JAN-2008 (RFI1)
Green	0.5-1000MHz	10W1000B	AR	23423	00123	II	04-FEB-2008 (RFI2)
Blue	0.01-250MHz	75A250	AR	19165	00039	II	03-NOV-2007 (NEBS & EU CRFI)
Black	0.01-250MHz	75A250	AR	23411	00122	II	29-DEC-2007 (NEBS & EU CRFI) / 20-APR-2008 (RFI1)
Orange	0.01-250MHz	75A250	AR	26827	00367	II	16-MAY-2008 (EU CRFI)/ 18-MAY-2008 (NEBS CRFI)
BROWN 150W	0.1-250MHz	150A250	AR	313454	1255	II	04-FEB-2008 (RFI2)
GTC 1-2.6	1.0-2.6 GHz	GRF5016A	GTC	1221	Rental	II	16-MAY-2008
Hughes 10W	2.0-4.0GHz	1177H01	Hughes	055	Rental	II	16-MAY-2008
Hughes 10W	4.0-8.0GHz	8010H02F	Hughes	240	Rental	II	16-MAY-2008
Hughes 10W	8-10.0GHz	80108	Hughes	138	Rental	II	17-MAY-2008
HP495A	7.0-10.0GHz	HP495A	HP	304-00237	00086	II	Out of Service (Spare)
Audio Amp	Audio Freq	MPA-200	Radio Shack	700438	none	III	NA
Audio Amp	Audio Freq	MPA-200	Radio Shack	708545	00862	III	NA

Field Probes	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Red	0.01-1000MHz	HI-4422	Holaday	90369	00031	I	23-MAR-2008
Green	0.01-1000MHz	HI-4422	Holaday	97363	00136	I	25-JUL-2007
Blue	0.01-1000MHz	HI-4422	Holaday	95696	01100	I	Out of Cal
Microwave Survey Meter	2450MHz	HI-1501	Holaday	00075464	1244	I	09-JAN-2008

Signal Generators	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Red	0.09-2000MHz	HP8648B	Agilent	3847U02192	00366	I	03-APR-2008
Blue	0.1-1000MHz	HP8648A	Agilent	3426A00548	00034	I	23-AUG-2007
Green	0.09-2000MHz	HP8648B	Agilent	3623A02072	00125	I	16-OCT-2007
Orange	0.1-1000MHz	HP8648B	Agilent	3537A01210	00025	I	29-JUN-2007
Brown	0.01Hz-15MHz	HP33120A	Agilent	US36016621	1211	I	Out of Service
White	0.01Hz-15MHz	HP33120A	Agilent	US36048143	1219	I	Out of Cal
Brown-White	0.01Hz-15MHz	HP33120A	Agilent	SG40019842	1232	I	10-NOV-2007
Blue-White	0.1Hz-13MHz	HP3312A	Agilent	1432A07632	00775	I	21-MAR-2008
Sweeper	0.01-20.0GHz	HP83752A	Agilent	3610A01133	00087	II	08-MAY-2008
AM/FM Stereo Sig. Gen.	0.1-170MHz	LG3236	Leader	3687301	00959	I	10-OCT-2008
Impulse Generator	1-100Hz	CIG-25	Electro-Metrics	290	00942	I	05-AUG-2007

Bulk Injection Clamps	Range	MN	Mfr	SN	Asset	Cat	Calibration Due
Green (NEBS CRFI)	0.01-100MHz	95236-1	ETS	50215	00118	II	03-NOV-2007(Blue) 29-DEC-2007(Blk) 18-MAY-2008(Orange)
Green (EU CRFI)	0.10-100MHz	95236-1	ETS	50215	00118	II	03-NOV-2007(Blue) 29-DEC-2007(Blk) 16-MAY-2008(Orange)
Red (NEBS CRFI)	0.01-100MHz	95236-1	ETS	34026	1020	II	07-NOV-2007(Blue) 29-DEC-2007(Blk) 18-MAY-2008(Orange)
Red (EU CRFI)	0.10-100MHz	95236-1	ETS	34026	1020	II	06-NOV-2007(Blue) 02-JAN-2008(Blk) 16-MAY-2008(Orange)
Blue (RTCA/DO-160E)	2-450MHz	9142-1N	Solar	063824	1237	II	
Rental	2–450MHz	9142-1N	Solar	008508	Rental	II	10-AUG-2007

ANSI T1.315	MN	Mfr	SN	Asset	Cat	Calibration Due
SBC Noise Cart		C-S			III	Calibration not Required
SBC Transient Cart		C-S			III	Waveshape verified before use

Oscilloscopes	MN	Mfr	SN	Asset	Cat	Calibration Due
EMC 100MHz	TDS 220	Tektronix	C036986	1166	I	25-APR-2008
ESD Reference 1GHz	TDS 684B	Tektronix	B011287	Rental	I	03-APR-2008
Product Safety 100 MHz	TDS 340	Tektronix	B012357	00737	I	03-OCT-2007
Telecom 100 MHz	54645A	HP/Agilent	US36320452	00103	I	30-JUN-2007

CDN Networks	Range	MN	Mfr	Asset	Cat	Calibration Due
Blue	0.10-100MHz	20A M-3	C-S	00806	II	03-NOV-2007 (Blue Amp) 29-DEC-2007 (Blk) 16-MAY-2008 (Orange)
Red	0.10-100MHz	15A M-3	C-S	00780	II	03-NOV-2007 (Blue Amp) 29-DEC-2007 (Blk) 16-MAY-2008 (Orange)

YELLOW-BLACK	0.10-100MHZ	15A M-3	C-S	00784	II	03-NOV-2007 (BLUE AMP) 29-DEC-2007 (BLK) 16-MAY-2008 (ORANGE)
GREEN	0.10-100MHZ	30A M-3	C-S	00779	II	03-NOV-2007 (BLUE AMP) 04-AUG-2007 (BLK) 16-MAY-2008 (ORANGE)
YELLOW	0.10-100MHZ	30A M-5	C-S	00804	II	03-NOV-2007(BLUE AMP) 16-MAY-2008 (ORANGE)
BROWN	0.10-100MHZ	M-3	C-S	1169	II	03-NOV-2007 (BLUE AMP) 29-DEC-2007 (BLK) 16-MAY-2008 (ORANGE)
BROWN-WHITE	0.10-100MHZ	M-3	C-S	1170	II	03-NOV-2007 (BLUE AMP) 29-DEC-2007 (BLK) 16-MAY-2008 (ORANGE)
BROWN-BLACK	0.10-100MHZ	M-2 (DC)	C-S	1171	II	03-NOV-2007 (BLUE AMP) 29-DEC-2007 (BLK) 16-MAY-2008 (ORANGE)
RED-BLACK	0.10-100MHZ	M-2 (DC)	C-S	1177	II	03-NOV-2007 (BLUE AMP) 29-DEC-2007 (BLK) 16-MAY-2008 (ORANGE)
GREEN-WHITE	0.10-100MHZ	M-2 (DC)	C-S	1259	II	03-NOV-2007 (BLUE AMP) 29-DEC-2007 (BLK) 16-MAY-2008 (ORANGE)
YELLOW (RES)	0.10-100MHZ	100Ω RESISTOR	C-S	00810	II	04-NOV-2007(BLUE AMP) 16-MAY-2008 (ORANGE) 02-JAN-2008(BLK)
GREEN (RES)	0.10-100MHZ	100Ω RESISTOR	C-S	1172	II	03-NOV-2007(BLUE AMP) 16-MAY-2008 (ORANGE) 02-JAN-2008(BLK)

RMS VOLTMETERS/CURRENT CLAMP	MN	MNFR	SN	ASSET	CAT	CALIBRATION DUE
TRUE-RMS MULTIMETER	79III	FLUKE	71700298	00769	I	27-OCT-2007
TRUE RMS MULTIMETER	179	FLUKE	89280616	1228	I	31-OCT-2007
TRUE-RMS MULTIMETER (REFERENCE)	177	FLUKE	83390024	00973	I	22-MAR-2008
TRUE-RMS MULTIMETER	177	FLUKE	83390025	00974	I	22-MAR-2008
TRUE-RMS MULTIMETER (TELECOM)	177	FLUKE	83430419	00975	I	22-MAR-2008
AC/DC CURRENT PROBE	A622	TEKTRONIX	08DD 6275DV	1246	I	31-JAN-2008

SURGE GENERATORS	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
TRANSIENT WAVEFORM MONITOR	TWM-5	CDI	003982	00323	II	05-JUN-2007
UNIVERSAL SURGE GENERATOR	M5	CDI	003966	00324	II	CAL BEFORE USE
THREE PHASE COUPLING NWK	3CN	CDI	003455	00325	II	CAL BEFORE USE
1.2X50US PLUGIN MODULE	1.2X50US PLUGIN	CDI	N/A	00842	II	CAL BEFORE USE
10X160US PLUGIN MODULE	10X160US PLUGIN	C-S	N/A	00843	II	CAL BEFORE USE
10X560US PLUGIN MODULE	10X560US PLUGIN	C-S	N/A	00841	II	CAL BEFORE USE
PSURGE CONTROLLER MODULE	PSURGE 8000	HAEFELY	150267	00879	II	06-JUN-2007
COUPLING/DECOUPLING MODULE	PCD 900	HAEFELY	149213	00880	II	06-JUN-2007
IMPULSE MODULE	PIM 900	HAEFELY	149202	00881	II	06-JUN-2007
HIGH VOLTAGE CAP NWK 5KVDC, 18µF	CS-HVCC	C-S	01	00772	II	14-JUN-2008
NEBS SURGE GENERATOR	N/A	C-S	N/A	00088	II	18-OCT-2007
2X10US SURGE GENERATOR	2X10US	C-S	N/A	00846	II	06-JUN-2007
10X700US SURGE GENERATOR	10X700US	C-S	N/A	00847	II	08-JUN-2007
12 PAIR SURGE RESISTOR MODULE	N/A	C-S	N/A	00768	II	18-OCT-2007
VSS 500-M	TSS 500 M12 S2	EMTEST	V0502100032	1155	II	CAL BEFORE USE
TSS 500-M	TSS500 M10	EMTEST	V0502100031	1156	II	CAL BEFORE USE
SCHAFFNER 2050 1.2X50 GENERATOR	2050	SCHAFFNER		DEMO	II	09-JAN-2008

POWER/NOISE METERS	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
POWER METER	435B	HP	2445A11012	00773	I	03-APR-2008
POWER METER	437B	HP	2912A01367	01099	I	03-APR-2008
POWER SENSOR	8481A	HP	2702A61351	00774	I	04-APR-2008
PSOPHOMETER	2429	BRUEL & KJAER	1237642	00585	II	23-FEB-2009
TRANSMISSION LINE TESTER (DBRNC)	185T	AMREL	18507030010	1236	II	20-APR-2008
TRANSMISSION LINE TESTER (DBRNC)	185T	AMREL	998658	00823	II	OUT OF SERVICE

OVERVOLTAGE CHAMBERS	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
72KW POWER FAULT SIMULATOR	OV1	C-S	N/A	00792	III	N/A
POWER FAULT SIMULATOR	OV2	C-S	N/A	00116	III	N/A

DIPOLE TAPE MEASURES	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
26FT TAPE #1	2338CME	LUFKIN	C3166-1	00776	II	22-MAR-2009
26FT TAPE #2	2338CME	LUFKIN	C3166-2	00777	II	22-MAR-2009

METEOROLOGICAL METERS	MN	MFR	SN	ASSET	CAT	CALIBRATION DUE
TEMP./HUMIDITY/ATM. PRESSURE GAUGE	7400 PERCEPTION II	DAVIS	N/A	00965	II	09-FEB-2009
TEMPERATURE /HUMIDITY GAUGE	THG-912	HUGER	4000562	00789	I	31-JAN-2009
WEATHER CLOCK (PRESSURE ONLY)	BA928	OREGON SCIENTIFIC	C3166-1	00831	I	08-FEB-2009

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

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

Conditions Of Testing

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

1. All orders for tests are subject to acceptance by the Company, and no order will constitute a binding commitment of the Company unless and until such order is accepted by it, as evidenced by the issuance of a written report ("**Test Report**") by the Company. The Test Report is issued solely by the Company, is intended for the exclusive use of Client and shall not be published, used for advertising purposes, copied or replicated for distribution to any other person or entity or otherwise publicly disclosed without the prior written consent of the Company. By submitting a request for services to the Company, Client consents to the disclosure to accreditation bodies of those records of Client relevant to the accreditation body's assessment of the Company's competence and compliance with relevant accreditation criteria. The Company shall not be liable for any loss or damage whatsoever resulting from the failure of the Company to provide its services within any time period for completion estimated by the Company. If Client anticipates using the Test Report in any legal proceeding, arbitration, dispute resolution forum or other proceeding, it shall so notify the Company prior to submitting the Test Report in such proceeding. The Company has no obligation to provide a fact or expert witness at such proceeding unless the Company agrees in advance to do so for a separate and additional fee.

2. The Test Report will set forth the findings of the Company solely with respect to the test samples identified therein. Unless specifically and expressly indicated in the Test Report, the results set forth in such Test Report are not intended to be indicative or representative of the quality or characteristics of the lot from which a test sample is taken, and Client shall not rely upon the Test Report as being so indicative or representative of the lot or of the tested product in general. The Test Report will reflect the findings of the Company at the time of testing only, and the Company shall have no obligation to update the Test Report after its issuance. The Test Report will set forth the results of the tests performed by the Company based upon the written information provided to the Company. The Test Report will be based solely on the samples and written information submitted to the Company by Client, and the Company shall not be obligated to conduct any independent investigation or inquiry with respect thereto.

3. The Company may, in its sole discretion, destroy samples which have been furnished to the Company for testing and which have not been destroyed in the course of testing. The Company may delegate the performance of all or a portion of the services contemplated hereunder to an affiliate, agent or subcontractor of the Company, and Client consents to such delegation.

4. These Conditions and the Test Report represent the entire understanding of the parties hereto with respect to the subject matter hereof and of the Test Report, and no modification, variance or extrapolation with respect thereto shall be permitted without the prior written consent of the Company.

5. The names, service marks, trademarks and copyrights of the Company and its affiliates, including the names "**BUREAU VERITAS**," "**BUREAU VERITAS CONSUMER PRODUCTS SERVICES**," "**BVCPS**", "**MTL**", "**ACTS**", "**MTL-ACTS**" and **CURTIS-STRAUS** (collectively, the "**Marks**") are and shall remain the sole property of the Company or its affiliates and shall not be used by Client except solely to the extent that Client obtains the prior written approval of the Company and then only in the manner prescribed by the Company. Client shall not contest the validity of the Marks or take any action that might impair the value or goodwill associated with the Marks or the image or reputation of the Company or its affiliates.

6. Payment in full shall be due 30 days after the date of invoice. Interest shall be due on overdue amounts from the due date until paid at an interest rate of 1.5% per month or, if less, the maximum rate permitted by law. The Company reserves the right, at any time and from time to time, to revoke any credit extended to Client. Client shall reimburse the Company for any costs it incurs in collecting past due amounts, including court costs and fees and expenses of attorneys and collection agencies. The Test Report may not be used or relied upon by Client if and for so long as Client fails to pay when due any invoice issued by the Company or any affiliate of it to Client or any affiliate or subsidiary of Client together with interest and penalties, if any, accrued thereon.

7. The Company disclaims any and all responsibility or liability arising out of or in connection with e-mail transmissions of such information.

8. Client understands and agrees that the Company is neither an insurer nor a guarantor, that the Company does not take the place of Client or any designer, manufacturer, agent, buyer, distributor or transportation or shipping company, and that the Company disclaims all liability in such capacities. Client further understands that if it seeks assurance against loss or damage, it should obtain appropriate insurance.

9. Client agrees that the Company, by providing the services, does not take the place of Client nor any third party, nor does the Company release them from any of their obligations, nor does the Company otherwise assume, abridge, abrogate or undertake to discharge any duty of any third party to Client or any duty of Client or any third party to any other third party, and Client will not release any third party from its obligations and duties with respect to the tested goods.

10. Client shall, on a timely basis, (a) provide adequate instructions to the Company in order to enable the Company to perform properly its services, (b) provide, or cause Client's suppliers and contractors to provide, the Company with all documents necessary to enable the Company to perform its services, (c) furnish the Company with all relevant information regarding Client's intended use and purposes of the tested goods, (d) advise the Company of essential dates and deadlines relevant to the tested goods and (e) fully exercise all rights and remedies available to Client against third parties in respect of the tested goods.

11. The Company shall undertake due care and ordinary skill in the performance of its services to Client, and the Company shall accept responsibility only were such skill has not been exercised and, even in such event, only to the extent of the limitation of liability set forth herein.

12. If Client desires to assert a claim arising from or relating to (i) the performance, purported performance or non-performance of any services by the Company or (ii) the sale, resale, manufacture, distribution or use of any tested goods, it must submit that claim to the Company in a writing that sets forth with particularity the basis for such claim within 60 days from discovery of the potential claim and not more than six months after the date of issuance of the Test Report to Client. Client waives any and all such claims including, without limitation, claims that the Test Report is inaccurate, incomplete or misleading or that additional or different testing is required, unless and then only to the extent that Client submits a written claim to the Company within both such time periods.

13. CLIENT SHALL, EXCEPT TO THE EXTENT OF COMPANY'S LIABILITY TO CLIENT HEREUNDER (WHICH IN NO EVENT SHALL EXCEED THE LIMITATION OF LIABILITY HEREIN), HOLD HARMLESS AND INDEMNIFY THE COMPANY, ITS AFFILIATES AND THEIR RESPECTIVE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND SUBCONTRACTORS AGAINST ALL ACTUAL OR ALLEGED THIRD PARTY CLAIMS FOR LOSS, DAMAGE OR EXPENSE OF WHATSOEVER NATURE AND

HOWSOEVER ARISING FROM OR RELATING TO (i) THE PERFORMANCE, PURPORTED PERFORMANCE OR NON-PERFORMANCE OF ANY SERVICES BY THE COMPANY OR (ii) THE SALE, RESALE, MANUFACTURE, DISTRIBUTION OR USE OF ANY TESTED GOODS.

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

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

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

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

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

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A2LA Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999

CURTIS-STRAUS[1]
527 Great Road
Littleton, MA 01460
Barry Quinlan Phone: 978-486-8880
ELECTRICAL

Valid until: July 31, 2007 Certificate Number: 1627.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following Electromagnetic Compatibility (EMC), Telecommunications, and Product Safety tests:

Electromagnetic Compatibility (EMC)
Radiated emissions testing (electric and magnetic fields)*; Conducted emissions testing (voltage and current)*; Electrostatic Discharge testing*; Electrical Fast Transient testing*; Radiated Immunity testing*; Conducted Immunity testing*; Lightning Immunity testing*; Voltage Dips*, Interrupts and Voltage Variations testing*; Magnetic Immunity testing*; RF Power measurements*; Frequency Stability Measurements*; Longitudinal Induction measurements*; Harmonic emissions testing*; Light flicker testing*; Low frequency disturbance voltage testing*; Disturbance Power measurements*; Power Cross Overvoltage testing*;

Test Type	Test Method(s)
Emissions	
Radiated and Conducted Emissions	FCC 47 CFR Parts 15 & 18; C63.4; CISPR 22; EN55022; SABS CISPR 22; AS/NZS CISPR 22; AS/NZS 3548; Canada ICES-003; CNS13438; KN 22 (RRL No. 2005-82, September 29, 2005); CISPR 11; EN 55011; SABS CISPR 11; AS/NZS CISPR 11; AS/NZS 2064; Canada ICES-001; CNS13803; CISPR 13; EN 55013; SABS CISPR 13; AS/NZS CISPR 13; AS/NZS 1053; CISPR 14-1; EN 55014-1; SABS CISPR 14; AS/NZS CISPR 14; AS/NZS 1044; CNS 13439; CISPR 15; EN 55015; GR-1089-CORE; CSA C108.8-M1983;
Harmonics	EN 61000-3-2; AS/NZS 61000.3.2
Flicker	EN 61000-3-3; AS/NZS 61000.3.3

1 Note: This accreditation covers testing performed at the laboratory listed above and the satellite facility located at 168 Ayer Rd, Littleton, MA 01460 and, for test types marked with an asterisk, at other sites as defined in *"A2LA specific criteria for the accreditation of site testing and site calibration laboratories."*

Immunity	RRL No. 2005-130 (December 27, 2005)
Electrostatic Discharge (ESD)	EN 61000-4-2; AS/NZS 61000.4.2; KN61000-4-2
Radiated Immunity (RFI)	EN 61000-4-3, AS/NZS 61000.4.3; KN61000-4-3
Electrical Fast Transient Bursts (EFT)	EN 61000-4-4; AS/NZS 61000.4.4; KN61000-4-4
Surge	EN 61000-4-5, AS/NZS 61000.4.5; KN61000-4-5
Conducted Immunity	EN 61000-4-6, AS/NZS 61000.4.6; KN61000-4-6
Magnetic Immunity	EN 61000-4-8; AS/NZS 61000.4.8; KN61000-4-8
Voltage Dips and Interrupts	EN 61000-4-11; KN61000-4-11
Low Frequency Conducted Disturbances	EN 61000-2-2

Family Product or Industry Specific Specifications *including emissions and/or immunity*	GR-1089-CORE; GR-78-CORE (ESD) EN50081-1; EN50081-2; EN50082-2; EN50082-1; EN 61000-6-1; EN 61000-6-2; EN 61000-6-3; EN 61000-6-4; EN 50091-2; EN 55024; CISPR 24 EN 55103-1; EN 55103-2; EN 61326; EN 61547; EN 50130-4; EN 50083-2; EN 60601-1-2; EN 60601-2-2; EN 60601-2-24; EN 60601-2-32; EN 60601-2-38; EN 60601-2-47; IEC 1800-3; EN 61800-3; EN 55020; CISPR 20; EN 60555 Part 2; EN 60555 Part 3; ETS 300 386-1; EN 300 386-2; EN 300 386, ETS 300 132-1; ETS 300 132-2; EN 60669-2-1; AS/NZS 3200.1.2; CNS 13783-1; ETR 283; C62.41
Radiocommunications	
EU R&TTE Radio Standards;	EN 300 220-1; EN 300 220-3; EN 300 330-1; EN 300 330-2; EN 300 440-1; EN 300 440-2; EN 300 328; EN 300 385; EN 301 893
EU R&TTE EMC Standards	EN 300 339; EN 301 489-01; EN 301 489-03; EN 301 489-17
Canada Radio Standards	RSS-102; RSS-117; RSS-118; RSS-119; RSS-123; RSS-125; RSS-128; RSS-129; RSS-130; RSS-131; RSS-132; RSS-133; RSS-134; RSS-135; RSS-136; RSS-137; RSS-138; RSS-141; RSS-142; RSS-170; RSS-181; RSS-182; RSS-187; RSS-188; RSS-191; RSS-192; RSS-193; RSS-195; RSS-210; RSS-212; RSS-213; RSS-215; RSS-243; RSS-GEN; RSS-310; GL-36;
Australia/New Zealand Radio Standards	AS/NZS 4268; AS/NZS 4771; RFS29; Radiocommunications (Data Transmission Equipment Using Spread Spectrum Modulation Techniques); Radiocommunications (Spread Spectrum Devices); Radiocommunications (Short Range Devices); Radiocommunications (Low Interference Potential Devices);

Other Radio Standards	RTTE 01 (DGT-Taiwan);

FCC Standards and Test methods Support TCB Status--	
FCC Scope A – Unlicensed Radio Frequency Devices	
A1	1. 47 CFR Parts 11, 15 and 18 2. FCC MP-5, 3. ANSI C63.4-2003,
A2	1. 47 CFR Part 15, 2. ANSI C63.4-2003,
A3	1. 47 CFR Part 15, 2. ANSI C63.17-1998, 3. ANSI C63.4-2003,
A4	1. 47 CFR Part 15, 2. ANSI C63.4-2003,
FCC Scope B – Licensed Radio Service Equipment	
B1	1. 47 CFR Parts 2, 22, 24, 25, and 27 2. ANSI/TIA-603-C (2004)
B2	1. 47 CFR Parts 2, 22, 74, 90, 95, and 97 2. ANSI/TIA-603-C (2004)
B3	1. 47 CFR Parts 2, 80, and 87 2. ANSI/TIA-603-C (2004)
B4	1. 47 CFR Parts 2, 21, 74, and 101 2. ANSI/TIA-603-C (2004)

Country Specific Standards and Other	
ITU EMC Standards	K.20; K.21; K.41; K.44
Swedish EMC Standards	BAKOM 3336.3
South African EMC Standards other then CISPR equivalents	SABS 1718-1; SANS 211/SABS CISPR 11; SANS 224/SABS CISPR 24; SANS 213/SABS CISPR 13; SANS 2200; SANS214-1/SABS CISPR 14-1; SANS214-2/SABS CISPR 14-2; SANS 215/SABS CISPR 15; SANS 222/SABS CISPR 22
Hong Kong EMC Standards	HKTA 1006; HKTA 1007; HKTA 1008; HKTA 1010; HKTA 1015; HKTA 1026; HKTA 1035; HKTA 1039; HKTA 1041; HKTA 1042; HKTA 1045
Singapore EMC Standards	IDA TS SRD; IDA TS EMC
Japanese VCCI Standards	VCCI V-3, VCCI V-4

Telecommunications
Telecommunications Registration; General test methods; Lightning surge*; Drop testing*; Balance testing*; Signal power (metallic and longitudinal)*; Frequency measurements*; Pulse templates*; Leakage testing*; Impedance testing*; Hearing Aid Compatibility testing (*excluding volume control*)*; Protocol analysis* and Jitter testing*.

Telecom Standards	Title
North American standards	
FCC 47 CFR Part 68 Telephone Terminal Equipment	Connection of terminal equipment to the telephone network. Analog and Digital Equipment. TCB Scope C1.
CS-03 Issue 9	Specification for terminal equipment, terminal systems, Network protection devices, connection arrangements and hearing aids compatibility.
TIA/EIA TSB31-B 1998	Bulletin Part 68 Rationale and Measurement Guidelines (Feb 1998)
TIA-968-A, A1, A2, A3	Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network
T1.TRQ.6-2001	Technical Requirements for SHDSL, HDSL2, HDSL4 Digital Subscriber Line Terminal Equipment to Prevent Harm to the Telephone Network Industry
Australia standards	
AS/ACIF S002-2001	Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network
AS/ACIF S016-2001	Requirements for Customer Equipment for connection to hierarchical digital interfaces
AS/ACIF S031-2001	Requirements for ISDN Basic Access Interface
AS/ACIF S038-2001	Requirements for ISDN Primary Rate Access Interface
AS/ACIF S043-2001	Requirements for Customer Equipment for Connection to a Metallic Local Loop Interface of a Telecommunications Network — Part 1: General Part 2: Broadband Part 3: DC, Low Frequency AC and Voice band
International standards	
ITU-T G.703	Physical/electrical characteristics of hierarchical Digital interfaces
Hong Kong standards	
HKTA 2011	Network Connection Specification for Connection of Customer Premises Equipment (CPE) to Direct Exchange Lines (DEL) of the Public Switched Telephone Network (PSTN) in Hong Kong
HKTA 2014	Network Connection Specification for Connection of Customer Premises Equipment (CPE) to the Public Telecommunications Network (PTN) in Hong Kong using ISDN Basic Rate Access (BRA) based on ITU-T Recommendations

Telecom Standards	Title
HKTA 2028	Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 1544 kbit/s
HKTA 2029	Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 2048 kbit/s
HKTA 2030	Network Connection Specification for Connection of Customer Premises Equipment (CPE) to the Public Telecommunications Network (PTN) in Hong Kong using Digital Leased Circuits at nx64 kbit/s
HKTA 2031	Network Connection Specification for Connection of Customer Premises Equipment (CPE) to the Public Telecommunications Network (PTN) in Hong Kong using Digital Leased Circuits below 64 kbit/s
HKTA 2032	Network Connection Specification for Connection of Customer Premises Equipment (CPE) to the Public Telecommunications Networks in Hong Kong using Asymmetric Digital Subscriber Lines (ADSL) based on ITU-T Recommendation G.992.1
HKTA 2033	Network Connection Specification for Connection of Customer Premises Equipment (CPE) to Fixed Telecommunications Networks in Hong Kong using Splitterless Asymmetric Digital Subscriber Lines (ADSL) based on ITU-T Recommendation G.992.2
European standards	
TBR 1: 1995	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
TBR 2: 1997	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
TBR 3: 1995 + Amdt : 1997	Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access
TBR 4: 1995 + Amdt : 1997	Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN primary rate access
TBR 012: 1993 + Amdt : 1996	Business Telecommunications (BT); Open Network Provision (ONP) technical requirements; 2 048 kbit/s digital unstructured leased line (D2048U) Attachment requirements for terminal equipment
TBR 013: 1996	Business TeleCommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Attachment requirements for terminal equipment interface

European standards (cont'd)	
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
TBR 24: 1997	Business TeleCommunications (BTC); 34 Mbit/s Digital Unstructured and structured leased lines (D34U and D34S); Attachment requirements for Terminal equipment interface
Taiwan standards (DGT)	
ADSL01	Asymmetric Digital Subscriber Line Terminal Equipment and POTS Splitter Technical Specifications
ID0002	DS1 Equipment Type Approval Guidelines
IS6100	ISDN Terminal Equipment Technical Specifications
PSTN01 (non-voice only)	Technical Specifications for Terminal Equipment for Connection to Public Switched Telephone Network
New Zealand standards	
PTC 200 (non-voice only)	Requirements for Connection of Customer Equipment to Analogue Lines
PTC 217	Requirements for Bandwidth Management Devices
TNA 117	Telecom 2048 kbit/s Standard Network Interface
PTC 270	Interim arrangements for ADSL CPE
Singapore Standards	
IDA TS ADSL	Type Approval Specification for Asymmetric Digital Subscriber Line (Full-rate ADSL) Modems
IDA TS ADSL 2	Type Approval Specification for Asymmetric Digital Subscriber Line Splitterless (G-Lite) Modems
IDA TS DLCN 1	Type Approval Specification for Digital Interfaces based on hierarchical bit rates of 2048 kbit/s, 34 368 kbit/s and 139 264 kbit/s
IDA TS ISDN 1	Type Approval Specification for connection of Terminal Equipment to Integrated Services Digital Network (ISDN) Basic Access
IDA TS ISDN 2	Type Approval Specification for connection of Terminal Equipment to Integrated Services Digital Network (ISDN) Primary Rate Access (PRA)
IDA TS PSTN (non-voice only)	Type Approval Specification for connection of Terminal Equipment to Public Switched Telephone Network (PSTN)
South Africa standards	
TE-001 (non-voice only)	Standard for Telecommunication Line Terminal Equipment (TLTE) for Connection to the Public Switched Telephone Network (PSTN)

Product Safety
General test methods:
Power input*, Permanence of marking*, Accessibility*, Permissibly limits*, Energy hazard measurement*, SELV circuits*, TNV limits*, Limited current*, Capacitor Discharge / voltage limitation*, Ring signal*, Humidity conditioning*, Creepage / Clearance / Distance thru Insulation (excluding CTI)*, Limited power measurement*, Ground Bond/Earthing*, Ground continuity*, Temperature*, Stability*, Applied force*, Steel sphere impact*, Mold stress*, Battery reverse current*, Ball pressure*, Leakage current*, Component abnormal*, Electric strength*, Impulse*, Overvoltage*, Acoustic sound pressure*, 130mm / 20mm flame*, Needle flame*, Hot flaming oil*, Locked rotor/motor armature*, Vibration, Bump, Drop*, Strain relief*, Torque*, Insulation resistance*, Sound level*, Handle loading*, Liquid overflow*, Spillage*, Liquid leakage*, Transformer shorts/overloads*, Rain test*, Wall mount*, Laser radiation (excluding x-ray)*, Voltage surge*, Functionality*, Protective impedance abnormal*, Capacitor short circuit abnormal*, Output abnormal*, Multi-supply abnormal*, Cooling abnormal*, Heating device abnormal*, Interlock abnormal*, Rigidity*, Cleaning*

Product Safety Standards	Title
Specific Product Safety Standards	
UL 60950 2000	Safety of information technology equipment
IEC 60950 1999	Safety of information technology equipment
EN 60950 2000	Safety of information technology equipment, including
IEC 60950-1 2001	Electrical business equipment.
UL 60950-1 2003	
CSA C22.2 No. 60950-00	
CSA C22.2 No. 60950-1 03	
IEC 61010-1 1993	Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements.
EN 61010-1 1993, 2001	Safety requirements for electrical equipment for measurement,
IEC 61010-1 2001	control and laboratory use, Part 1: General requirements.
UL 61010B-1 2003	
CAN/CSA 1010-1 1999 (*Including AM 2*)	Electrical equipment for laboratory use Part 1: General requirements.
IEC 60601-1 1995	Medical electrical equipment. Part 1: General requirements for safety.
EN 60601-1 1995 (*Including AM 2*)	Medical electrical equipment
UL 2601-1 1997	Medical electrical equipment. Part 1: General Requirements for safety.
IEC 60065 1998, 2000	Audio, video and similar electronic apparatus – Safety requirements
ANSI/UL 6500: 1998	Audio/video and musical instrument apparatus for Household,
CAN/CSA 60065-00	commercial and similar general use Australian/New Zealand
AS/NZS 60065 2000	Standard – Approval and test Specification – Mains operated electronic and related Equipment for household and similar general use
Canadian C22.2 No. 1-94 (1-98)	Audio, video and similar electronic equipment.
1994, 1998	Consumer and commercial products
EN 60065 1994	Safety requirements for main operated electronic and related apparatus for household and similar general use.
IEC 60825 1990	Radiation safety of laser products, equipment Classification, requirements and user's guide
EN 60825-1 1994	Safety of laser products Part 1: equipment

Product Safety Standards	Title
IEC 60825-1 2001	Classification, requirements and user's guide.
IEC 60825-2 2000-5	Safety of laser products – Part 2: Safety of optical communication systems
IEC 60825-4 1997-11	Safety of laser products – Part 4: Laser guards
21 CFR 1040.10	Performance standard for laser products
IEC 60335-1 1995	Safety of household and similar electrical appliances
(*Including AM2 – 1997 & AM 12 – 1997*)	Part 1: General requirements
EN 60335-1 2001	
UL 60335-1 1998	
CAN/CSA E335-1 1994	
UL 61010A-1: 2002	Electrical equipment for laboratory use; part 1: General requirements
EN 61010-1: 2001	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
AS/NZS 60950: 2000	Safety information technology equipment
EN 60950-1: 2001	Information Technology Equipment – Safety – Part1: General Requirements
AS/NZS 60950.1: 2003	Information Technology Equipment – Safety – General requirements
UL 61010 -1: 2004	Electrical Equipment for Measurement, Control and Laboratory Use; Part 1: General Requirements
UL 60601-1: 2003	Medical Electrical Equipment, Part 1: General Requirements for Safety
IEC 60601-1-1: 2000	Medical Electrical Equipment - Part 1: General Requirements For Safety 1: Collateral Standard: Safety Requirements For Medical Electrical Systems
EN 60601-1-1: 2001	Medical Electrical Equipment - Part 1: General Requirements for Safety – Section 1-1. Collateral Standard: Safety Requirements For Medical Electrical Systems
UL 60065: 2003	Audio, Video and Similar Electronic Apparatus – Safety Requirements
CSA 60065: 2003	Audio, Video and Similar Electronic Apparatus – Safety Requirements
IEC 60065: 2001	Audio, Video and Similar Electronic Apparatus – Safety Requirements
EN 60065: 2002	Audio, Video and Similar Electronic Apparatus – Safety Requirements
EN 60204 -1: 1998	Safety of Machinery – Electrical Equipment of Machines – Part 1: Specification for General Requirements
HKTA 2001	Compliance Test Specification – Safety and Electrical Protection Requirements for Subscriber Equipment Connected to the Public Telecommunications Networks In Hong Kong

Environmental Simulation

Test Technology	Test Standard	Supporting Standards
Accessibility*	IEC 60529	IP-0x thru IP-6x
Acoustic Noise*	GR-63-CORE Sec 4.6	
Airborne Contaminants	GR-63-CORE Sec 4.5	MFG & Hygroscopic Dust
Altitude	GR-63-CORE Sec 4.1.3	
Cold Start*	ETS 300 019	IEC 60068-2-1
Drip	IEC 60529	IP-x1 & IP-x2
Drops*	ETS 300 019	IEC 60068-2-32
	GR-63-CORE Sec 4.3	
Dust	IEC 60529	IP-5x & IP-6x
Firearms Resistance Testing	GR-487	
Fire Resistance	ANSI.T1.319	
	GR-63-CORE Sec 4.2	Fire & Needle Flame
Heat Dissipation*	GR-63-CORE Sec 4.1.4	
Illumination	GR-63-CORE Sec 4.7	
Operational Temperature & Humidity (OpTH)*	ETS 300 019	IEC 60068-2-1 IEC 60068-2-2 IEC 60068-2-14 IEC 60068-2-56
	GR-63-CORE Sec 4.1.2	
Salt Fog & Spray	ASTM B117	
Spatial*	GR-63-CORE Sec 2.0 & 3.0	
Spraying-Splashing	IEC 60529	IP-x3 & IP-x4
Storage (Temperature & Humidity)*	ETS 300 019	IEC 60068-2-1 IEC 60068-2-2 IEC 60068-2-14 IEC 60068-2-30 IEC 60068-2-56
	GR-63-CORE Sec 4.1.1	
Vibration	ETS 300 019	IEC 60068-2-6 IEC 60068-2-27 IEC 60068-2-29 IEC 60068-2-32 IEC 60068-2-57 IEC 60068-2-64 Earthquake, Office & Transportation
	GR-63-CORE Sec 4.4	
Water Immersion	IEC 60529	IP-x7 & IP-x8
Water Jet	IEC 60529	IP-x5 & IP-x6

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

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