

Report No	EE0412-1
Client	Adaptive Instrument Corp. 577 Main street Hudson, MA 01749
Phone	978-562-0154
Fax	978-562-2563
FRN	0007941438
Models	16363
FCC ID	QQN16363
Equipment Type Equipment Code	Part 15 Spread Spectrum Transmitter DSS
Results	As detailed within this report
Prepared by	 Mairaj Hussain – Test Engineer
Authorized by	 Michael Buchholz – EMC Manager
Issue Date	6/14/04
Conditions of issue	This Test Report is issued subject to the conditions stated in ‘terms and conditions’ section of this

Summary	3
Test Methodology	3
EUT Configuration	4
Test Data and Plots	5
Verifying Antenna Gains	5
Spurious Radiated Emissions Data	7
Duty Cycle Correction Factor	9
Test Equipment Used	10
Terms And Conditions	14
A2LA Accreditation	16

Summary

This report supports a Class II permissive change intended to add new antennas to FCC ID QQN16363 of a transmitter operating under 47 CFR 15.247 of the FCC rules for operation in the frequency band of 902 – 928MHz. The product covered by this report is 16363 which is 915 MHz FHSS Digital Relay Radio System (DRRS) RF module.

The manufacture intends to add the following antennas:

- i) Yagi Antennas:
 - a) Y8963 Gain: 8.15dBi
 - b) Y8966 Gain: 11.14dBi
- ii) Omni-directional:
 - a) FG9023 Gain: 5.14dBi
 - b) FG9026 Gain: 8.14dBi

The product was tested with the highest gain antenna from each family mentioned above. Fundamental was checked in order to verify the antenna's gain. Spurious emissions were checked to verify the compliance of the product with FCC 15.209. To pass the requirements, the lowest data rate for the transmission is limited to 19.2Kbits/sec. At this data rate manufacturer can take advantage of 20dB allowance for duty cycle correction factor.

Tx power was set to the max level of 12.5dBm during the testing.

A detailed description of the above-mentioned antenna can be found in the antenna exhibit.

Test Methodology

All testing was performed according to the procedures specified in ANSI C63.4 (2000). The product was tested with modulation on and peak readings were compared against the average limit presented in section CFR 15.247.

Frequency range investigated:	30MHz – 10GHz
--------------------------------------	---------------

Measurement Distance:		
<i>Frequency (MHz)</i>	<i>Distance (m)</i>	<i>Comments</i>
Fundamental	3 m	Radiated
30MHz – 10GHz except 902-928 MHz band	3m	Radiated Spurious Measurements

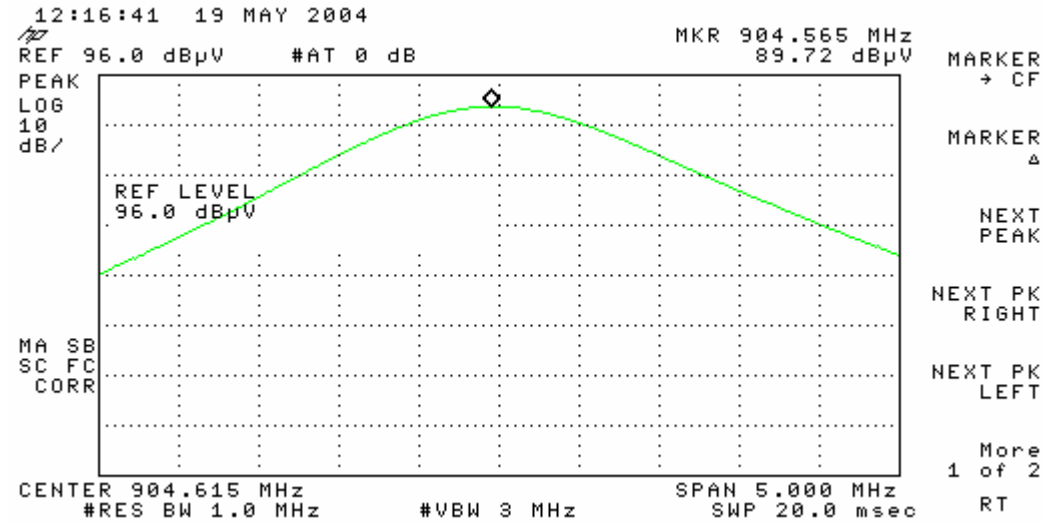
All readings are peak unless otherwise noted.

EUT Configuration

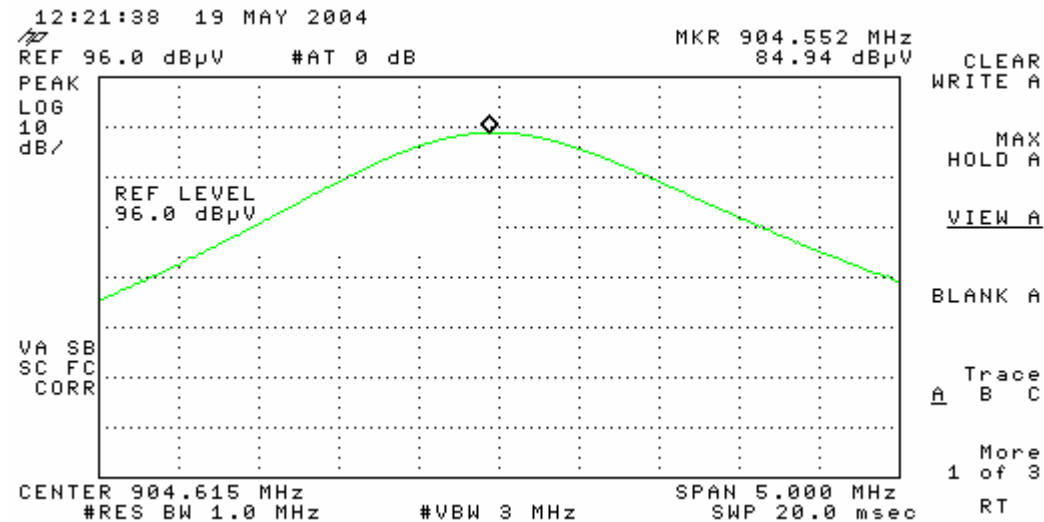
EUT Configuration				
Work Order: E0412				
Company: Adaptive Instrument Corp.				
Company Address: 577 Main Street Hudson, MA 01749				
Contact: Jeffery Cho				
Person(s) Present: Jeffery Cho				
	MN	SN	FCC ID	
EUT:	16363	-	QQN16363	
EUT Description: 915 MHz FHSS RF Module				
EUT Max Frequency: 902 - 928 MHz				
Support Equipment:	MN	SN	FCC ID	
Agilent Power supply	E3630A	MY40001033	-	
EUT Cables:	Qty	Shielded?	Length	Ferrites
None				
Unpopulated EUT Ports:	Qty	Reason		
None				
Software / Operating Mode Description:				
The product was tested for EMI in transmit mode.				

Test Data and Plots**Verifying Antenna Gains**

a: Yagi Y8966; Gain 9dBd or 11.14dBi

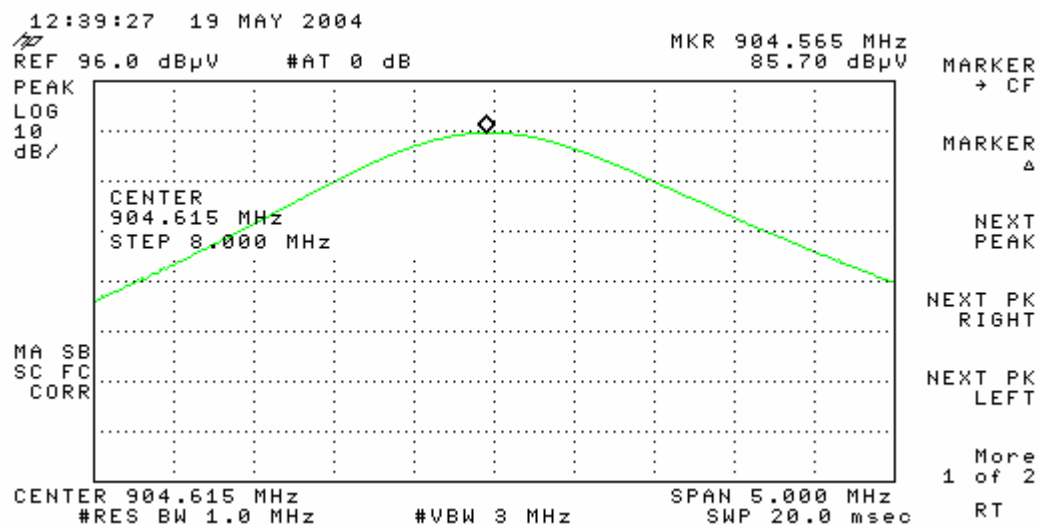


H



V

b: Omni-directional antenna FG9026; Gain 6dBd or 8.14dBi



V

Antenna Gain Verification							Curtis-Straus LLC				
Date: 19-May-04			Company: Adaptive Instruments				Work Order: E0412				
Engineer: Mairaj Hussain			EUT Desc: 16363								
							Distance: 3 m				
Notes:											
							Antenna gain verification				
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBμV/m)	EIRP (dBm)	Tx power (dBm)	Antenna Gain (dBi)		
(Yagi) Hpk	904.56	89.7	0.0	21.6	5.0	116.3	21.1	12.5	8.6		
(Omni directional)Vpk	904.56	85.7	0.0	21.6	5.0	112.3	17.1	12.5	4.6		
Test Site: "T"			Pre-Amp: none		Cable: 65 ft RG8A/U		Analyzer: Yellow		Antenna: Green		

Sample calculation:

Adjusted reading = Reading + Antenna factor + Cable factor

EIRP = Adjusted reading + 20*log(distance) – 104.7

Spurious Radiated Emissions Data

Radiated Emissions Table											Curtis-Straus LLC		
Date: 19-May-04			Company: Adaptive Instrument Corp						Work Order: E0412				
Engineer: Mairaj Hussain			EUT Desc: 16363										
Frequency Range: 30 - 1000MHz restricted bands								Measurement Distance: 3 m					
Notes: Antenna Yagi 8966													
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)	Margin (dB)	Result (Pass/Fail)	Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)	
H	125.9	45.5	65.5	12.8	1.5	38.4				43.5	-5.1	Pass	
H	267.1	43.0	21.5	13.3	2.3	37.1				46.0	-8.9	Pass	
H	327.3	38.3	21.5	14.6	2.6	34.0				46.0	-12.0	Pass	
Table Result:		PASS		by		-5.1 dB		Worst Freq:		125.9 MHz			
Test Site: "T"		Pre-Amp: Green		Cable: 65 ft RG8A/U		Analyzer: Yellow		Antenna: Green					

Radiated Emissions Table											Curtis-Straus LLC		
Date: 19-May-04			Company: Adaptive Instrument Corp						Work Order: E0412				
Engineer: Mairaj Hussain			EUT Desc: 16363										
Frequency Range: 1 - 10GHz (restricted bands)							Measurement Distance: 3 m						
Notes:													
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Duty Cycle Factor (dB)	Adjusted Reading			CFR 15.209			
							Reading (dBμV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)	
Tx power 12.5dBm, DR 76.8Kb (Tx power includes 0.5dB loss for the antenna cable)													
Yagi 8966 antenna:													
Hpk	2713.4	61.5	24.2	30.7	2.2	-	70.2			74.0	-3.8	Pass	
H 10hz vbw	2713.4	60.6	24.2	30.7	2.2	20.0	49.3			54.0	-4.7	Pass	
V 10hz vbw	2713.4	59.0	24.2	30.7	2.2	20.0	47.7			54.0	-6.3	Pass	
Hpk	1687.9	53.0	23.6	27.5	1.7	-	58.6			74.0	-15.4	Pass	
H 10hz vbw	1687.9	39.0	23.6	27.5	1.7	20.0	24.6			54.0	-29.4	Pass	
Hpk	3618.7	46.5	24.5	33.4	2.6	-	58.0			74.0	-16.0	Pass	
H 10hz vbw	3618.7	43.0	24.5	33.4	2.6	20.0	34.5			54.0	-19.5	Pass	
Test Site: "T"			Pre-Amp: Or-Blk		Cable: 3 RG142LL		Analyzer: Orange			Antenna: Orange Horn			

Radiated Emissions Table											Curtis-Straus LLC		
Date: 19-May-04				Company: Adaptive Instrument Corp						Work Order: E0412			
Engineer: Mairaj Hussain				EUT Desc: 16363									
Frequency Range:				30 - 1000 MHZ (Restricted bands)						Measurement Distance: 3 m			
Notes: Antenna FG9026													
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBμV/m)				CFR 15.209			
										Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)	
Vpk	117.0	47.4	21.4	12.7	1.4	40.1				43.5	-3.4	Pass	
V	121.4	49.4	22.2	12.9	1.4	41.5				43.5	-2.0	Pass	
Vpk	251.8	43.0	21.5	13.1	2.2	36.8				46.0	-9.2	Pass	
Vpk	325.5	35.5	21.5	14.6	2.6	31.2				46.0	-14.8	Pass	
Vpk	403.0	35.0	21.5	16.6	2.9	33.0				46.0	-13.0	Pass	
Vpk	612.0	29.0	20.9	19.3	3.8	31.2				46.0	-14.8	Pass	
Test Site: "T"		Pre-Amp: Green		Cable: 65 ft RG8A/U		Analyzer: Yellow			Antenna: Green				

Radiated Emissions Table***Curtis-Straus LLC***

Date: 19-May-04			Company: Adaptive Instrument Corp						Work Order: E0412		
Engineer: Mairaj Hussain			EUT Desc:								
Frequency Range: 1 - 10GHz (restricted bands)								Measurement Distance: 3 m			
Notes: Antenna FG9026											
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Duty Cycle Factor (dB)	Adjusted Reading (dBμV/m)		FCC Class B		
									Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)
Hpk 10hz vbw	2714.0	55.3	24.2	30.7	2.2	20.0	44.0		54.0	-10.0	Pass
Hpk	2714.1	57.3	24.2	30.7	2.2	-	66.0		74.0	-8.0	Pass
Hpk	1687.0	45.0	23.6	27.4	1.7	-	50.5		54.0	-3.5	Pass
Hpk	3618.0	44.2	24.5	33.4	2.6	-	55.7		74.0	-18.3	Pass
Hpk 10hz vbw	3618.0	41.2	24.5	33.4	2.6	20.0	32.7		54.0	-21.3	Pass
Test Site: "T"			Pre-Amp: Or-Blk		Cable: 3 RG142LL		Analyzer: Orange		Antenna: Orange Horn		

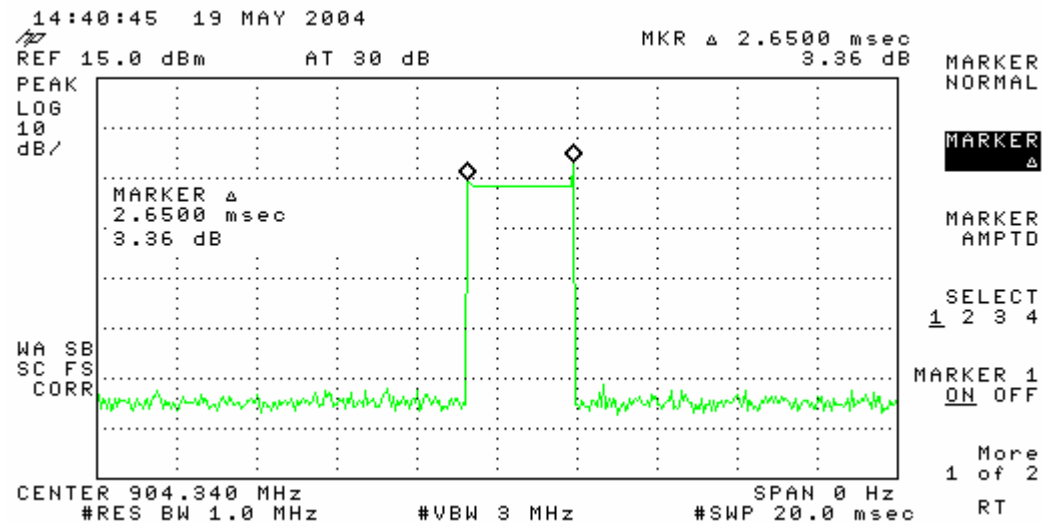
Note: Reading < 1000 MHz are QP, readings > 1000 MHz are average.

Sample calculation:

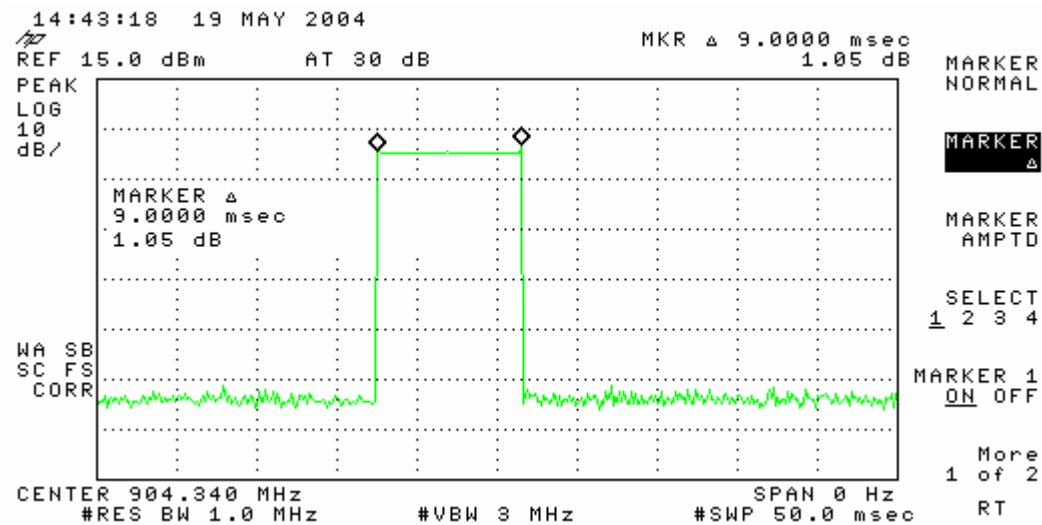
Adjusted reading = Reading + Antenna factor + Cable factor – Pre amp factor

Duty Cycle Correction Factor

Measured Dwell Time:



DR 76.8Kbits/sec



DR 19.2Kbits/sec

Duty Cycle Correction Factor for Data Rate: 76.8KB/sec

$$DCCF = 20 * \log \left(\frac{2.65ms}{100ms} \right)$$

$$DCCF = -31.5dB$$

Duty Cycle Correction Factor for Data Rate: 19.2KB/sec

$$DCCF = 20 * \log \left(\frac{9.0ms}{100ms} \right)$$

$$DCCF = -20.9dB$$

Note: -20dB factor for the calculations was used.

REPORT:EE0412-1
Test Equipment Used

FCC ID:QQN16363

REV. 5/7/04

SPECTRUM ANALYZERS	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
RED	9kHz-1.8GHz	8591E	HP	3441A03559	00024	21-MAY-2004
WHITE	9kHz-22GHz	8593E	HP	3547U01252	00022	04-MAR-2005
BLUE	9kHz-1.8GHz	8591E	HP	3223A00227	00070	30-SEP-2004
YELLOW	9kHz-2.9GHz	8594E	HP	3523A01958	00100	08-JUL-2004
GREEN	9kHz-26.5GHz	8593E	HP	3829A03618	00143	10-OCT-2004
BLACK	9kHz-12.8GHz	8596E	HP	3710A00944	00337	15-JUL-2004
YELLOW-BLACK	20Hz-40.0MHz	3585A	HP	2504A05219	00030	02-DEC-2004
ORANGE	9kHz-26.5GHz	E4407B	HP	US39440975	00394	27-JUN-2004

LISNS/MEASUREMENT PROBES	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
RED	10kHz-30MHz	8012-50-R-24-BNC	SOLAR	956348	00753	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	150kHz-30MHz	CS A/C-10	C-S	CS01	00296	11-SEP-2004
CISPR 22 TELCO ISN	9kHz-30MHz	FCC-TLISN-T4	FISCHER	20115	00746	15-OCT-2004

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

ANTENNAS	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
GREEN BILOG	30MHz-2GHz	CBL6112B	CHASE	2742	00620	06-APR-2006
GREEN-BLACK BILOG	30MHz-2GHz	CBL6112B	CHASE	2412	00127	06-JAN-2006
GREEN-RED BILOG	30MHz-2GHz	CBL6112B	CHASE	2435	00990	06-APR-2006
RED BILOG	30MHz-1GHz	3143	EMCO	1270	00042	17-MAR-2005
BLUE BILOG	30MHz-1GHz	3143	EMCO	1271	00803	17-MAR-2005
GRAY BILOG	26MHz-2GHz	3141	EMCO	9703-1038	00066	19-MAY-2005(EMI) / 06-JUN-2004(RFI)
YELLOW-BLACK BILOG	20-2000MHz	CBL6140A	CHASE	1112	00126	19-MAY-2005(EMI) / 09-JUN-2004(RFI)
YELLOW HORN	1-18GHz	3115	EMCO	9608-4898	00037	22-MAY-2005
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	16-SEP-2004
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

MIXERS/DIPLEXERS	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
MIXER / HORN	26.5-40 GHz	11970A/28-442-6	HP/ATM	2332A00900/A046903-01	00369	09-JUL-2004
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

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	31-JUL-2004
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	29-JUL-2004
YELLOW-BLACK	1-20GHz	SMC-12A	C-S	535055	00801	19-AUG-2004
ORANGE-BLACK	1-20GHz	SMC-12A	C-S	637367	00761	29-JUL-2004
HF (YELLOW)	18-26.5GHz	AFS4-18002650-60-8P-4	C-S	467559	00758	15-JUL-2004
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

ABSORBING CLAMPS	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
FISCHER CLAMP	30-1000MHz	F-201-23MM	FISCHER	10	00081	16-JAN-2006

EFT	MN	MFR	SN	ASSET	CALIBRATION DUE
EFT DIRECT COUPLING CAP	N/A	C-S	01	00794	29-JAN-2006

ESD GENERATORS	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	11-JUN-2004

BEST EMC-2	MN	MFR	SN	ASSET	CALIBRATION DUE
BLUE	711-1100	SCHAFFNER	199824-002SC	00117	16-JUN-2004 (SURGE) / 03-SEP-2004 (D+I) / 05-NOV-2004 (EFT)
RED	711-1100	SCHAFFNER	200122-074SC	00623	17-JUN-2004 (SURGE) / 03-SEP-2004 (D+I) / 05-NOV-2004 (EFT)

CHAMBERS AND STRIPLINE	MN	MFR	SN	ASSET	CALIBRATION DUE
RFI 1 CHAMBER	3 METER COMPACT	PANASHIELD	N/A	00797	09-JUN-2004
RFI 2 CHAMBER	04' x 07' SHIELDING SYSTEM	LINDGREN	13329	00795	06-JUN-2004
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

AMPLIFIERS	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
RED	0.5-1000MHz	10W1000B	AR	18708	00032	12-JUN-2004
GREEN	0.5-1000MHz	10W1000B	AR	23423	00123	24-MAY-2004
BLUE	0.01-250MHz	75A250	AR	19165	00039	19-JAN-2005(CRFI) / 12-JUN-2004 (RFI)
BLACK	0.01-250MHz	75A250	AR	23411	00122	25-MAR-2005(CRFI) / 25-MAR-2005(RFI)
ORANGE	0.01-250MHz	75A250	AR	26827	00367	19-JAN-2005(CRFI) / 05-JAN-2005(RFI)
HP489A	1.0-2.0GHz	HP489A	HP	449-00762	00971	10-FEB-2005
HP491C	2.0-4.0GHz	HP491C	HP	449-00638	00764	16-OCT-2004
HP493A	4.0-8.0GHz	HP493A	HP	171402242	00085	16-OCT-2004
HP493A (SPARE)	4.0-8.0GHz	HP493A	HP	449-00562	00771	01-DEC-2004

HP495A	7.0-12.0GHz	HP495A	HP	904-00237	00086	16-OCT-2004
--------	-------------	--------	----	-----------	-------	-------------

FIELD PROBES	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
RED	0.01-1000MHz	HI-4422	HOLADAY	90369	00031	14-MAY-2004
GREEN	0.01-1000MHz	HI-4422	HOLADAY	97363	00136	11-MAY-2005

SIGNAL GENERATORS	RANGE	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	15-JUL-2004
GREEN	0.09-2000MHz	HP8648B	HP	3623A02072	00125	10-SEP-2004
ORANGE	0.1-1000MHz	HP8648B	HP	3537A01210	00025	21-MAY-2004
BLACK	15MHz	HP33120A	HP	US36004674	00766	12-NOV-2004
YELLOW	15MHz	HP33120A	HP	US36014119	00249	21-MAY-2004
BLUE-WHITE	0.1Hz-13MHz	HP3312A	HP	1432A07632	00775	09-MAR-2005
SWEeper	0.01-20.0GHz	HP83752A	HP	3610A01133	00087	04-APR-2005

BULK INJECTION CLAMPS	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
RED	0.01-100MHz	95236-1	TEGAM	12248	00035	19-JAN-2005
GREEN	0.01-100MHz	95236-1	EMCO	50215	00118	19-JAN-2005

CDN NETWORKS	RANGE	MN	MFR	SN	ASSET	CALIBRATION DUE
BLACK	0.10-100MHz	20A M-2	C-S	04	00783	07-JAN-2005
BLUE	0.10-100MHz	15A M-3	C-S	05	00806	07-JAN-2005
RED	0.10-100MHz	15A M-3	C-S	06	00780	07-JAN-2005
WHITE	0.10-100MHz	15A M-3	C-S	07	00782	07-JAN-2005
YELLOW-BLACK	0.10-100MHz	15A M-3	C-S	08	00784	07-JAN-2005
BLUE-BLACK	0.10-100MHz	15A M-3	C-S	09	00781	07-JAN-2005
GREEN	0.10-100MHz	30A M-3	C-S	10	00779	07-JAN-2005
YELLOW	0.10-100MHz	30A M-5	C-S	11	00804	07-JAN-2005
BLUE-WHITE	0.10-100MHz	15A M-5	C-S	12	00788	07-JAN-2005
YELLOW (RES)	0.10-100MHz	100Ω RESISTOR NWK	C-S	01	00810	10-SEP-2004
GREEN (RES)	0.10-100MHz	100Ω RESISTOR NWK	C-S	02	00785	09-MAR-2005

HARMONIC ANALYZER	MN	MFR	SN	ASSET	CALIBRATION DUE
HFTS	HP6842A	HP	3531A-00169	00738	03-DEC-2005

FREQUENCY COUNTER	MN	MFR	SN	ASSET	CALIBRATION DUE
5340A	HP5340A	HP	1440A02320	00787	30-JUL-2004

SURGE GENERATORS	MN	MFR	SN	ASSET	CALIBRATION DUE
TRANSIENT WAVEFORM MONITOR	TWM-5	CDI	003982	00323	18-JUN-2004
UNIVERSAL SURGE GENERATOR	M5	CDI	003966	00324	13-JUN-2004
THREE PHASE COUPLING NWK	3CN	CDI	003455	00325	13-JUN-2004
1.2x50uS PLUGIN MODULE	1.2x50uS PLUGIN	CDI	N/A	00842	13-JUN-2004
10x160uS PLUGIN MODULE	10x160uS PLUGIN	C-S	N/A	00843	12-JUN-2004
10x560uS PLUGIN MODULE	10x560uS PLUGIN	C-S	N/A	00841	12-JUN-2004
10x700uS PLUGIN MODULE w/ EXTENSION BOX	10x700uS PLUGIN	C-S	N/A	00844/845	12-JUN-2004
PSURGE CONTROLLER MODULE	PSURGE 8000	HAEFELY	150267	00879	11-JUN-2004
COUPLING/DECOUPLING MODULE	PSD 900	HAEFELY	149213	00880	11-JUN-2004
IMPULSE MODULE	PIM 900	HAEFELY	149202	00881	11-JUN-2004
HIGH VOLTAGE CAP NWK 5kVDC, 18μF	CS-HVCC	C-S	01	00772	15-OCT-2004
NEBS SURGE GENERATOR	N/A	C-S	N/A	00088	17-JUN-2004
2x10uS SURGE GENERATOR	2x10uS	C-S	N/A	00846	18-JUN-2004
10x700uS SURGE GENERATOR	10x700uS	C-S	N/A	00847	12-JUN-2004
12 PAIR SURGE RESISTOR MODULE	N/A	C-S	N/A	00768	18-SEP-2004

OSCILLOSCOPES	MN	MFR	SN	ASSET	CALIBRATION DUE
OSCILLOSCOPE 100MHZ	TDS 220	TEKTRONIX	B068748	00885	03-JUN-2004
OSCILLOSCOPE 100MHZ (SAFETY)	TDS 340	TEKTRONIX	B012357	00737	16-OCT-2004
OSCILLOSCOPE 100MHZ (TELECOM)	54645A	HP	US36320452	00103	30-JUN-2004

POWER SUPPLIES	MN	MFR	SN	ASSET	CALIBRATION DUE
10001i/2 AC POWER SYSTEM	(2) 500i	CALIFORNIA INSTRUMENTS	HK53687/HK53688	00376	31-FEB-2004

RMS VOLTMETERS/CURRENT CLAMP	MN	MNFR	SN	ASSET	CALIBRATION DUE
TRUE-RMS MULTIMETER	79III	FLUKE	71700298	00769	15-OCT-2004
TRUE-RMS MULTIMETER	177	FLUKE	83390024	00973	08-MAR-2005
TRUE-RMS MULTIMETER (REFERENCE)	177	FLUKE	83390025	00974	08-MAR-2005
TRUE-RMS CLAMP METER (SAFETY)	36	FLUKE	68805882	00700	05-MAR-2005
POWER/NOISE METERS	MN	MFR	SN	ASSET	CALIBRATION DUE
POWER METER	435B	HP	2445A11012	00773	07-APR-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
OVERVOLTAGE CHAMBERS	MN	MFR	SN	ASSET	CALIBRATION DUE
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
DIPOLE TAPE MEASURES	MN	MFR	SN	ASSET	CALIBRATION DUE
26FT TAPE #1	2338CME	LUFKIN	C3166-1	00776	26-FEB-2005
26FT TAPE #2	2338CME	LUFKIN	C3166-2	00777	26-FEB-2005
METEOROLOGICAL METERS	MN	MFR	SN	ASSET	CALIBRATION DUE
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
TRACEABLE CLOCKS	MN	MFR	SN	ASSET	CALIBRATION DUE
5003	5003	CONTROL COMPANY	99026940	00808	09-DEC-2004
CONSUMABLES	SPEC.	MFR	STOCK/MN	ASSET	CALIBRATION DUE
NEBS CHEESE CLOTH	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

<u>SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999</u> CURTIS-STAUS¹ 527 Great Road Littleton, MA 01460 Barry Quinlan Phone: 978-486-8880 ELECTRICAL Valid until: July 31, 2005 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 <u>Electromagnetic Compatibility (EMC), Telecommunications, and Product Safety tests:</u> 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 <table border="1"> <thead> <tr> <th>EMC Standards</th> <th>Title</th> </tr> </thead> <tbody> <tr> <td>Emissions</td> <td></td> </tr> <tr> <td>CISPR 22 1997 with amendments 1 and 2</td> <td>Limits and methods of measurement of radio disturbance characteristics of information technology equipment.</td> </tr> <tr> <td>CNS13438 1994</td> <td>Limits and methods of measurement of radio interference characteristics of information technology equipment.</td> </tr> <tr> <td>EN55022:1994 and 1998</td> <td>Limits and methods of measurement of radio disturbance characteristics of information technology equipment.</td> </tr> <tr> <td>SABS CISPR 22:1997</td> <td>Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement</td> </tr> <tr> <td>Canada ICES-003 1997</td> <td>Digital apparatus</td> </tr> <tr> <td>AS/NZS 3548 1995</td> <td>Australian/New Zealand Standard Limits and methods of measurement of radio disturbance characteristics of information technology equipment</td> </tr> <tr> <td>CISPR 11 1990, 1997, 1999</td> <td>Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.</td> </tr> </tbody> </table> ¹ Note: This accreditation covers testing performed at the laboratory listed above and the satellite facility located at 168 Ayer Rd, Littleton, MA 01460		EMC Standards	Title	Emissions		CISPR 22 1997 with amendments 1 and 2	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.	CNS13438 1994	Limits and methods of measurement of radio interference characteristics of information technology equipment.	EN55022:1994 and 1998	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.	SABS CISPR 22:1997	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement	Canada ICES-003 1997	Digital apparatus	AS/NZS 3548 1995	Australian/New Zealand Standard Limits and methods of measurement of radio disturbance characteristics of information technology equipment	CISPR 11 1990, 1997, 1999	Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.
EMC Standards	Title																		
Emissions																			
CISPR 22 1997 with amendments 1 and 2	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.																		
CNS13438 1994	Limits and methods of measurement of radio interference characteristics of information technology equipment.																		
EN55022:1994 and 1998	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.																		
SABS CISPR 22:1997	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement																		
Canada ICES-003 1997	Digital apparatus																		
AS/NZS 3548 1995	Australian/New Zealand Standard Limits and methods of measurement of radio disturbance characteristics of information technology equipment																		
CISPR 11 1990, 1997, 1999	Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.																		
(A2LA Cert. No. 1627-01) 10/31/03 Page 1 of 11																			
EN 55011 1991, 1998 Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment. SABS CISPR 11:1997 Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics Limits and methods of measurement Canada ICES-001 1998 Industrial, scientific and medical radio frequency generators CNS13803 Industrial, Scientific and Medical Instrument AS/NZS 2064: 1997 Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment. CSA C108.8 – M1983 Electromagnetic Emission from Data Processing Equipment and Electronic Office Machines CISPR 13:1996, 1998, 2001 Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment. EN 55013: 1990, 2001 Sound and television broadcast receivers and associated equipment: Electromagnetic compatibility. Part 1: Specification for limits and methods of measurement of radio disturbance characteristics of broadcast receivers and associated equipment. EN 55013 Amend 12 1994 Limits and methods of measurement of radio disturbance characteristics of broadcast receivers and associated equipment. Amendment 12 SABS CISPR 13: 1996 Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment. CNS 13439 Broadcast receivers and associated equipment Limits and methods of measurement of radio interference characteristics of sound and television broadcast receivers and associated equipment. AS/NZS 1053: 1999 Limits and methods of measurement of radio disturbance characteristics of electrical motor- operated and thermal appliances for household and similar purposes, electric tools and electric apparatus. CISPR 14 1993 (except discontinuous disturbances) Limits and methods of measurement of radio disturbance characteristics of electrical motor- operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus. EN 55014 1993, 1997 (discontinuous disturbances) Limits and methods of measurement of radio disturbance (except characteristics of electrical motor- operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus. AS/NZS 1044: 1995 (discontinuous disturbances) Limits and methods of measurement of radio disturbance (except characteristics of electrical motor- operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus. Immunity CNS13783-1 Household Electrical Appliances SABS CISPR 14-1 1993 Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus Part 1: Emission – Product family standard SABS CISPR 14-2 1997 + A1:2001 Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus Part 2: Immunity - Product family standard																			
(A2LA Cert. No. 1627-01) 10/31/03 Page 2 of 11																			
CISPR 14-2 1996, 1997 + A1:2001 Immunity requirements for household appliances, tools and similar apparatus. CISPR 20: 1995, 2002 with amendment 3 Limits and methods of measurement of immunity characteristics of sound and television broadcast receivers and associated equipment. (associated group only) EN 55020: 1995, 2002 Electromagnetic immunity of broadcast receivers and Associated equipment. (associated group only) CISPR 24 Information technology equipment – Immunity characteristics – Limits and methods of measurement SABS CISPR 24 1997 Information technology equipment – Immunity characteristics – Limits and methods of measurement AS/NZS 3200.1.2: 1995 Approval and test specification – Medical electrical Equipment – General requirements for safety – Collateral Standard: Electromagnetic compatibility – Requirements and tests. European Union Basic EMC Standards EN 61000-4-2: 1995, 1999, 2001 Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 2: Electrostatic discharge immunity test – Basic EMC Publication EN 61000-4-3:1997, 1998, 2002 Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 3: Radiated, radio-frequency, electromagnetic field immunity test AS/NZS 61000.4.3 1999 Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 4: Electrical fast transient/burst immunity test – Basic EMC publication EN 61000-4-4 1995 Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 5: Surge immunity test. EN 61000-4-5 1995 Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 6: Immunity to conducted disturbances, induce by radio-frequency fields. AS/NZS 61000.4.5 1999 Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 8: Power frequency magnetic field immunity test. EN 61000-4-6 1996 Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 11: Voltage dips, short interruptions and voltage Variations immunity tests. AS/NZS 61000.4.6 1999 Electromagnetic compatibility (EMC). Part 2: Environment, Section 2: Compatibility levels for low-frequency conducted disturbances and signaling in public low-voltage power supply systems (IEC 1000-2-2:1990) EN 61000-4-8 1994 EN 61000-4-11 1994 ENV 61000-2-2 1993 EU Product Family Standards EN 50081-1 1992 Electromagnetic capability – Generic emission standard. Part 1: Residential, commercial and light industry. (I.S.) EN 50081-2 1993 Electromagnetic compatibility – Generic emission standard. Part 2: Industrial environment EN 50082-1 1992, 1998 Electromagnetic compatibility – Generic emission standard. Part 1: Residential, commercial and light industry EN 50082-2 1995 Electromagnetic compatibility – Generic immunity Standard. Part 2: Industrial environment																			
(A2LA Cert. No. 1627-01) 10/31/03 Page 3 of 11																			
EN 61000-6-1: 1997, 2001 Electromagnetic Compatibility (EMC)- Part 6: Generic standards- Section 1: Immunity for residential, commercial and light-industrial environments EN 61000-6-2: 1998, 2001 Electromagnetic Compatibility (EMC)- Part 6: Generic standards- Section 2: Immunity for industrial environments EN 50091-2 1996 Specification for Uninterruptible Power Systems (UPS). Part 2: EMC requirements EN 55024 1998 Information technology equipment – Immunity Characteristics – Limits and methods of measurement. EN 55103-1 1997 Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Part 1: Emission EN 55103-2 1997 Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control professional use. Part 2: Immunity (excluding Annex A3) EN 61326 1998 Electrical equipment for measurement, control and laboratory use – EMC requirements EN 61547 1996 Equipment for general lighting purposes – EMC immunity requirements EN 50130-4 1996 Alarm Systems. Part 4: Electromagnetic compatibility. Product family standard: Immunity requirements for components of fire, intruder and social alarm systems. EN 55104 1995 Electromagnetic compatibility immunity – requirements for household appliances, tools and similar apparatus. Product family standard. EN 50083-2 1995 Cabled distribution systems for television and sound signals. Part 2: Electromagnetic compatibility for equipment. EN 60601-1-2: 1993, 2002 Medical electrical equipment Part 1: general requirements for safety Section 2: Collateral standard: Electromagnetic compatibility – requirements and tests IEC 1800-3 1995 Adjustable speed electrical power drive systems. Part 3: EMC product standard including specific test methods. EN 60555 Part 2 1987 Disturbances in supply systems caused by household appliances and similar electrical equipment. Part 2: Harmonics EN 60555 Part 3 1987 Disturbances in supply systems caused by household appliances and similar electrical equipment. Part 3: Voltage fluctuations. EN 61000-3-2: 1995, 2000 Electromagnetic compatibility (EMC). Part 3: Limits Section 2: Limits for harmonic current emissions AS/NZS 61000.3.2 1998 Electromagnetic compatibility (EMC). Part 3: Limits Section 2: Limitation of voltage fluctuations and flicker in low-voltage supply systems. EN 61000-3-3 1995 AS/NZS 61000.3.3 1999 ETS 300 386-1 1994 Equipment Engineering (EE): Public telecommunication network equipment electro-magnetic compatibility (EMC) requirements Part 1: Product family overview, compliance criteria and test levels																			
(A2LA Cert. No. 1627-01) 10/31/03 Page 4 of 11																			

ETS EN 300 386-2 1997, 1998, ETS EN 300 386 2000 v1.2.1, 2001 v1.3.1 ETS 300 132-1 1996 ETS 300 132-2 1996 ETR 283 1997 <i>EU radio standards</i> (ETS) EN 300 385 v1.2.1: 1998, 1999 EN 300 330 v1.2.1: 1998, 1999 ETS 300 328 1996 ETS EN 300 440 v1.2.1 1999 EN 301 893:2002 v1.2.1 ETS 300 836-1:1998 EN301 489-17:2002 v1.2.1 (A2LA Cert. No. 1627-01) 10/31/03	Electromagnetic compatibility and radio spectrum matters (ERM); Telecommunication network equipment; Electromagnetic compatibility (EMC) requirements; Part 2: Product family standard. 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 Equipment Engineering (EE); Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (dc) Equipment Engineering (EE); Transient voltages at Interface A on telecommunications direct current (DC) power distributions. Electromagnetic compatibility and Radio spectrum matters (ERM); Electromagnetic Compatibility (EMC) standard for fixed radio links and ancillary equipment (ETS) 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 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 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 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 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 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 Page 5 of 11	EN 300 328-2:2001 v1.2.1 EN 301 489-1:2002 EN 60669-2-1:2002 <i>Canada Radio Standards</i> Canadian GL-36 1995 Canadian RSS-119 1999, 2000 Issue 6 Canadian RSS-134 1996 & 2000, Issue 1 Rev 1 Canadian RSS-210 2000 Issue 3, RFS29 1998 <i>FCC Standards</i> 47 CFR FCC low power transmitters operating on frequencies below 1 GHz, emergency alert systems, unintentional radiators and ISM devices. 47 CFR FCC low power transmitters operating on frequencies above 1 GHz, with the exception of spread spectrum devices. 47 CFR FCC Unlicensed Personal Scope A3 Communications System (PCS) devices 47 CFR FCC Unlicensed National Scope A4 Information Infrastructure devices and low power transmitters using spread spectrum techniques. 47 CFR FCC Personal mobile Scope B1 Radio Services in the following FCC Rule Parts 22, 24, 25, 27. 47 CFR FCC General Mobile Radio B2 Scope Services in the following FCC Rule Parts 22, 74, 90, 95, 97. 47 CFR FCC Maritime and Aviation B3 Scope Radio Services in 47 CFR Parts 80 and 87 47 CFR FCC Microwave Radio Services B4 Scope in 47 CFR Parts 21, 74 and 101. 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 Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements Switches for household and similar fixed electrical installations -- Part 2-1: Particular requirements -- Electronic switches Industry Canada -- technical requirements for low power Devices in the 2400 -- 2483.5 MHz band. Industry Canada -- Land mobile and fixed radio Transmitters and receivers, 27.41 to 960.0 MHz Industry Canada -- 900 MHz narrowband personal communications services Industry Canada -- Low power license-exempt radio 2001 Issue 5 communication devices Specification for Restricted Radiation Radio Apparatus (New Zealand) Scope A1 Scope A2 Scope A3 Scope A4 B1 B2 B3 B4 (A2LA Cert. No. 1627-01) 10/31/03 Page 6 of 11
FCC/OST MP-5 1986 GR-1089-CORE: 1997, 1999 issue 2/ 2002 Issue 3 <i>ANSI EMC Standards</i> ANSI C63.4: 1992, 1999, 2001 ANSI C63.5 1988 <i>IEEE EMC Standards</i> IEEE C62.41: 1980, 1991 <i>Swedish EMC Standards</i> BAKOM 3336.3 1995 <i>South African EMC standards other than CISPR equivalents</i> SABS 1718-1: 1996 <i>Japanese VCCI Standards</i> VCCI V-3/99.05 1999 VCCI V-4/99.05 1999 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 FCC 47 CFR Part 68 Telephone CS-03 Issue 8 1996 through amendment 5 TIA/EIA TSB31-B 1998 (A2LA Cert. No. 1627-01) 10/31/03	FCC (Federal Communications Commission) methods Of measurement of radio noise emissions from industrial, scientific and medical equipment. Bellcore electromagnetic compatibility and electrical safety -- Generic criteria for network telecommunications equipment. 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. American National Standard for electromagnetic compatibility -- radiated emissions measurements in electromagnetic interference (EMI) control -- calibration of antennas. IEEE recommended practice on surge voltages in low-voltage AC power circuits Electromagnetic compatibility and electrical safety (EMC & S) for wired terminal equipment. Harmonization document information over the OFCOM requirements. South African Bureau of Standards: Specification for Gaming equipment. Part 1: Casino equipment. Technical Requirements Instruction for Test Conditions for Requirement under Test Connection of terminal equipment to the telephone Terminal Equipment network. Analog and Digital Equipment. TCB Scope C1. Specification for terminal equipment, terminal systems, Network protection devices, connection arrangements and hearing aids compatibility. Bulletin Part 68 Rationale and Measurement Guidelines (Feb 1998) Page 7 of 11	TIA/EIA-IS-968 TIA/EIA-IS-883 TIA-968-A T1.TRQ.6-2001 Canada VDSL Issue 1 January 2003 AS/ACIF S002-2001 AS/ACIF S016-2001 AS/ACIF S031-2001 AS/ACIF S038-2001 AS/ACIF S043-2001 ITU-T G.703 HKTA 2028 HKTA 2029 TBR 1 : 1995 TBR 2 : 1997 Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network Telecommunications Telephone Terminal Equipment Supplemental Technical Requirements for Connection of Sutter Dial Tone Detection Devices and ADSL Modems to the Telephone Network Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network Technical Requirements for SHDSL, HDSL2, HDSL4 Digital Subscriber Line Terminal Equipment to Prevent Harm to the Telephone Network Industry Terminal Attachment Program Requirements and Test Methods for Very-High-Bit-Rate Digital Subscriber Line (VDSL) Terminal Equipment Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network Requirements for Customer Equipment for connection to hierarchical digital interfaces Requirements for ISDN Basic Access Interface Requirements for ISDN Primary Rate Access Interface 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 Voiceband Physical/electrical characteristics of hierarchical Digital interfaces Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 1544 kbit/s Network connection specification for connection of CPE to the PTNs in Hong Kong using digital leased circuits at data rate of 2048 kbit/s 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 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 (A2LA Cert. No. 1627-01) 10/31/03 Page 8 of 11

TBR 3 : 1995 + Amdt : 1997 TBR 4 : 1995 + Amdt : 1997 TBR 012 : 1993 + Amdt : 1996 TBR 013 : 1996 TBR 21 : 1998 TBR 24 : 1997 Australia TS 002 : 1997 TS 016 : 1997 TS 031 : 1997 TS 038 : 1997 AS/ACIF S043.2:2001 Product Safety General test methods; Input tests; Electric strength tests; Impulse tests; Permanency of marking tests; Accessibility tests; Energy Hazard measurements; Capacitor discharge tests; Humidity conditioning; Earthing tests; Limited power source measurements; Stability tests; Steel ball tests; Lithium Battery Reverse Current measurements; Leakage current tests; Transformer abnormal tests; Telecom leakage tests; Over voltage/power cross tests (excluding x-ray tests). <u>Product Safety Standards</u> <i>Specific Product Safety Standards</i> IEC 950 1991 UL 1950 1998 CSA C22.2 No.950-95 UL 60950 2000 (A2LA Cert. No. 1627-01) 10/31/03 Page 9 of 11	Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN primary rate access Business Telecommunications (BT); Open Network Provision (ONP) technical requirements; 2 048 kbit/s digital unstructured leased line (D2048U) Attachment requirements for terminal equipment Business Telecommunications (BTC); 2 048 kbit/s digital structured leased lines (D2048S); Attachment requirements for terminal equipment interface 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 Business Telecommunications (BTC); 34 Mbit/s digital Unstructured and structured leased lines (D34U and D34S); Attachment requirements for terminal equipment interface Analogue Interworking and Non interference Requirements for Customer Equipment Connected to the Public Switched Telephone Network General Requirements for Customer Equipment Connected to Hierarchical Digital Interfaces Requirements for ISDN Basic Access Interface Requirements for ISDN Primary Rate Access Interface Requirements for Customer Equipment for connection to a metallic loop interface of a Telecommunications Network – Part 2 Broadband Safety of information technology equipment Safety of information technology equipment, including Electrical business equipment. Approval and test specification – Safety of information technology equipment including electrical business 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) Australian Communications Authority – Safety requirements for customer equipment. Telephone Equipment Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements. Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements. Electrical equipment for laboratory use Part 1: General requirements. Electrical measuring and test equipment. Part 1: General requirements. Medical electrical equipment. Part 1: General requirements for safety. Medical electrical equipment Medical electrical equipment. Part 1: General Requirements for safety. Audio, video and similar electronic apparatus – Safety requirements Audio/video and musical instrument apparatus for Household, commercial and similar general use 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 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 systems Safety of laser products – Part 4: Laser guards Safety of household and similar electrical appliances Part 1: General requirements IEC 60950 2000 EN 60950 1997, 1998, 2000 IEC 60950-1 2001 UL 60950-1 2003 CSA C22.2 No. 60950-00 CSA C22.2 No. 60950-1 03 AS/NZS 3260 1993 AS/NZS 3260 Supp 1 1996 ACA TS 001 1997 UL 1459 1995 IEC 1010-1 1990 IEC 61010-1 1993 EN 61010-1 1993, 2001 IEC 61010-1 2001 UL 61010B-1 2003 UL 3101-1 1993 CAN/CSA 1010-1 1999 (Including AM 2) UL 3111-1 1996 UL 3121-1 1995 IEC 60601-1 1995 EN 60601-1 1995 (Including AM 2) UL 2601-1 1997 IEC 60065 1998, 2000 ANSI/UL 6500: 1998 CAN/CSA 60065-00 AS/NZS 3250 1995 AS/NZS 60065 2000 Canadian C22.2 No. 1-94 (1-98) 1994, 1998 EN 60065 1994 IEC 60825 1990 EN 60825-1 1994 IEC 60825-1 2001 IEC 60825-2 2000-5 IEC 60825-4 1997-11 IEC 60335-1 1995 (Including AM2 – 1997 & AM 12 – 1997) EN 60335-1 2001 UL 60335-1 1998 CAN/CSA E335-1 1994 (A2LA Cert. No. 1627-01) 10/31/03 Page 10 of 11
UL 61010A-1 : 2002 EN 61010-1 : 2001 AS/NZS 60950 : 2000 Environmental² <u>Environmental Standards</u> GR-63-CORE ETS 300 019 (vibration up to 1000Hz) Electrical equipment for laboratory use; part 1: General requirements Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements Safety information technology equipment NEBS Requirements: Physical Protection Environmental conditions and environmental tests For telecommunications equipment ² Environmental testing is performed at the satellite facility located at 168 Ayer Rd, Littleton, MA 01460 (A2LA Cert. No. 1627-01) 10/31/03 Page 11 of 11	