Emissions
Test Report

EUT Name: Ranger DVF Transmitter

EUT Model: CZ725F

FCC 47 CFR Part 27 and Part 2

Prepared for:

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Statement of Compliance

Manufacturer:	Harris Corporation 3200 Wismann Lane Quincy, IL 62301 (217) 222-8200
Requester / Applicant:	Karl Williams
Name of Equipment:	Ranger DVF Transmitter
Model No.	CZ725F
Type of Equipment:	Terrestrial Sound Broadcast Equipment
Class of Equipment:	Intentional Radiator
Application of Regulations:	FCC 47 CFR Part 27 and Part 2
Test Dates:	10 December 2007 to 21 December 2007

Guidance Documents:

Emissions: FCC 47 CFR Part 27 and Part 2

Test Methods:

Emissions: TIA/EIA 603-C (2004)

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that a sample of one, of the equipment described above, has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. This report contains data that are not covered by NVLAP accreditation. This report shall not be reproduced except in full, without the written authorization of the laboratory.

1 April 2008

Reviewer Date

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1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC 47 CFR Part 27 and Part 2 based on the results of testing performed on *10 December* 2007 through *21 December* 2007 on the *Ranger DVF Transmitter* Model No. *CZ725F* manufactured by Harris Corporation. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

1.3 Summary of Test Results

Table 1 - Summary of Test Results

Emission	Test Method(s)	Results	Result
Conducted Power	Part 2.1046 (a), (c) and TIA/EIA 603-C 2.1046 (a)	722 Watts	Compliant
Occupied Bandwidth	Part 2.1049 (h) and TIA/EIA 603-C	5.39 MHz	Compliant
Spurious Emissions at Antenna Terminals	FCC Part 2.1051 and FCC Part 27.53 (f)	Worst Case = -74.908 dBc	Compliant
Radiated Spurious Emissions	FCC Part 2.1053, FCC Part 27.53 (f), and TIA/EIA 603-C	Worst Case = -72.61 dBc	Compliant

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland at the 762 Park Ave., Youngsville, N.C 27596 address is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 90552 and 100881). The laboratory scope of accreditation includes: Title 47 CFR Part 15, 18, and 90. The accreditation is updated every 3 years.

2.1.2 NIST / NVLAP

TUV Rheinland is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Standard 17025:2005 (Lab code 200094-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Canada – Industry Canada

Registration No. IC3755

2.1.4 Japan - VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland at the 762 Park Ave. Youngsville, N.C 27596 address has been assessed and approved in accordance with the Regulations for Voluntary Control Measures. (Registration No. R-1174, R-1679, C-1790 and C-1791).

2.1.5 Acceptance By Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at the 762 Park Ave. Youngsville, N.C 27596 address test results and test reports within the scope of the laboratory NIST / NVLAP accreditation will be accepted by each member country.

2.2 Test Facilities

All of the test facilities are located at 762 Park Ave., Youngsville, North Carolina 27596, USA.

2.2.1 Emission Test Facility

The Open Area Test Site and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:2003, at a test distance of 3 and 10 meters. This site has been described in reports dated May 12, 1997, submitted to the FCC, and accepted by letter dated June 25, 1997 (31040/SIT 1300F2). The site is listed with the FCC and accredited by NVLAP (code 200094-0). The 5m semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:2003, at a test distance of 3 meters. A report detailing this site can be obtained from TUV Rheinland.

2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7m x 3.7m x 3.175mm thick aluminum floor connected to PE ground. For ESD testing, tabletop equipment is placed on a 0.5mm thick insulated mat on a 1.6m x 0.8m x 0.8m high non-conductive table with a 3.175mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. The Vertical Coupling Plane consists of an aluminum plate 50cm x 50cm x 3.175mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. For each of the other tests, the HCP is removed.

RF Field Immunity testing is performed in a 7.3m x 3.7m x 3.2m anechoic chamber.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.9m x 3.7m x 3.175mm thick aluminum ground plane which is connected to one end of the anechoic chamber.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st addition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or co-variances of these other quantities weighted according to how the measurement result varies with changes in these quantities. The term standard uncertainty is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

The test system for conducted emissions is defined as the LISN, spectrum analyzer, coaxial cables, and pads. The test system for radiated emissions is defined as the antenna, spectrum analyzer, pre-amplifier, coaxial cables, and pads. The test system for radiated immunity is defined as the antenna, amplifier, cables, signal generator field probe and spectrum analyzer. The test system for conducted immunity is defined as the coupling/decoupling device, amplifier, cables, signal generator and spectrum analyzer. The test system for voltage variations and interruptions immunity is defined as the AC power source and the interruptions generator. The test system for electrical fast transient immunity is defined as the AC power output source and the fast transient generator. The test system for lightning surge immunity is defined as the AC power output source and the lightning surge generator. The test system for electrostatic discharge immunity is defined as the air and contact discharge generators. The test system for power frequency magnetic field immunity is defined as the AC voltage source. The test system for the damped oscillatory wave immunity is defined as the AC power output source and the oscillatory wave generator. The test system for harmonic current and voltage flicker test is defined as the AC power source and the detection devices. The conducted emissions test system has a combined standard uncertainty of ± 1.2 dB. The radiated emissions test system has a combined standard uncertainty of ± 1.6 dB. The radiated immunity test system has a combined standard uncertainty of ± 2.7 dB. The conducted immunity test system has a combined standard uncertainty of ± 1.5 dB. The voltage variations and interruptions immunity test system has a combined standard uncertainty of ± 4.3 dB. The electrical fast transients immunity test system has a combined standard uncertainty of ± 5.8 dB. The lightning surge immunity test system has a combined standard uncertainty of ± 8.0 dB. The electrostatic discharge immunity test system has a combined standard uncertainty of ± 4.1 dB. The power frequency magnetic field immunity test system has a combined standard uncertainty of ± 0.58 dB. The damped oscillatory wave immunity test system has a combined standard uncertainty of ± 8.7 dB. The harmonic current and voltage flicker test system has a combined standard uncertainty of ± 11.6 dB. The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005.

3 Emissions

3.1 Conducted Power Output Part 2.1046 (a), (c)

Testing was performed in accordance with Part 2.1046 (a), (c) and TIA/EIA 603-C.

3.1.1 Test Methodology

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8).

The output power at the transmitter output flange and at the output from the output bandpass filter were both measured while operating into a standard test load, using a calibrated RF power meter.

3.1.2 Results

Output Measured before the filter
722 Watts

Output Measured after the filter
631 Watts

3.2 Occupied Bandwidth Part 2.1049

Testing was performed in accordance with Part 2.1049 (h) and TIA/EIA 603-C.

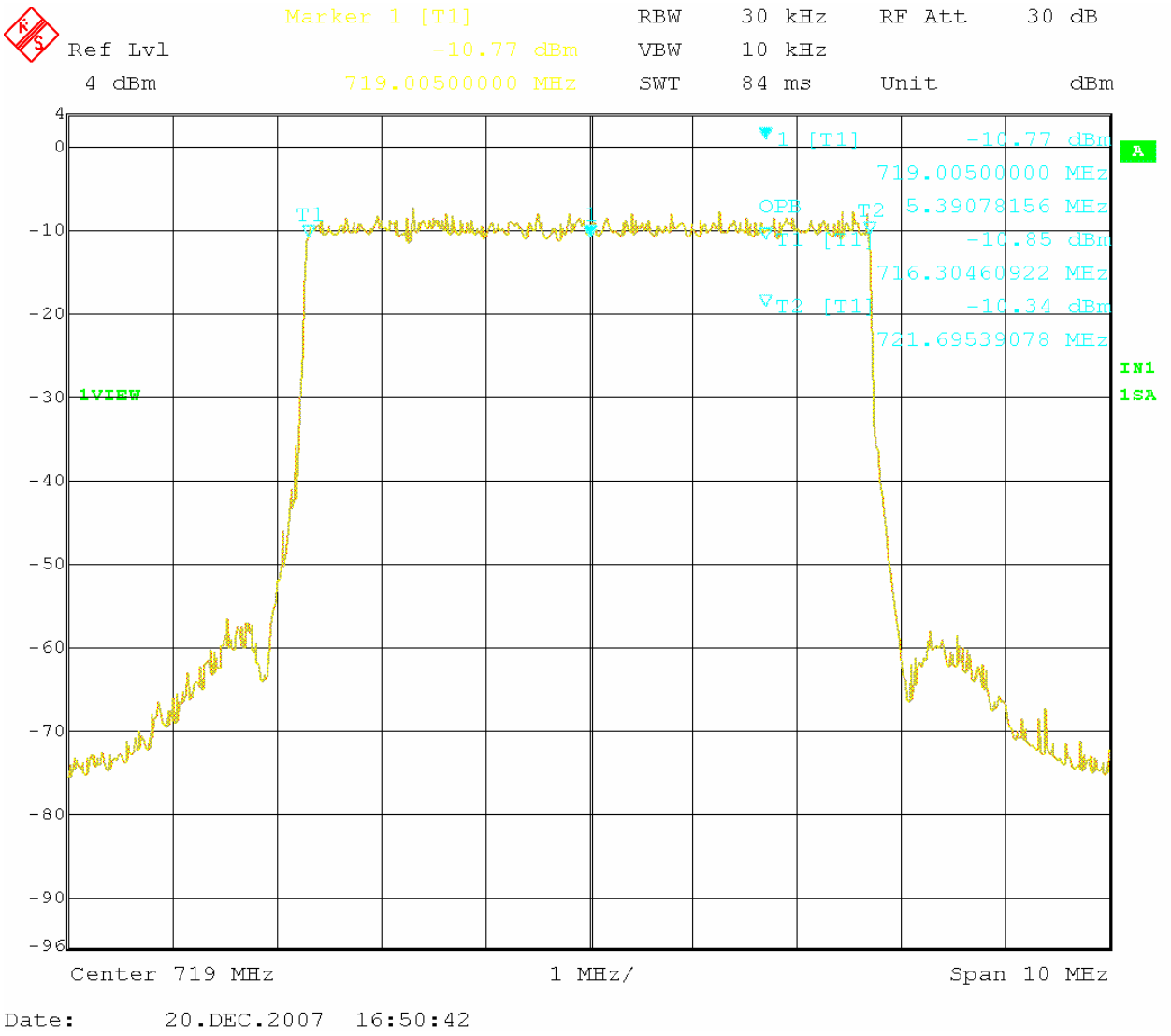
3.2.1 Test Methodology

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

(h) Transmitters employing digital modulation techniques--when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at the discretion of the user.
Measurements were made after the filter.

3.2.2 Test Results

5.39 MHz



3.3 Spurious Emissions at Antenna Terminals

Testing was performed in accordance with FCC Part 2.1051 and FCC Part 27.53 (f).

3.3.1 Test Methodology

Part 2.1051
The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

Part 27.53 (f)

For operations in the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

Measurements were made after the filter.

Limit = 43 + 10 log (631)dB = 71

3.3.2 Test Results

Pass

Freq in MHZ	dBm Power	Measured	CF	dBc	Limit dBc	Margin dB
716	58	-67.64	50.732	-74.908	-71	3.908
722	58	-69.5	50.732	-76.768	-71	5.768
722.19	58	-72.3	50.732	-79.568	-71	8.568
799.25	58	-70	50.732	-77.268	-71	6.268
1438	58	-79	53.1684	-83.8316	-71	12.8316
2157	58	-88	56.8943	-89.1057	-71	18.1057
2876	58	-87	54.0531	-90.9469	-71	19.9469
3595	58	-88	55.1737	-90.8263	-71	19.8263
4314	58	-85.5	43.9027	-99.5973	-71	28.5973
5033	58	-86.3	37.4211	-106.8789	-71	35.8789
5752	58	-88	35.0579	-110.9421	-71	39.9421
6471	58	-86	46.9289	-97.0711	-71	26.0711
7190	58	-90	50.2663	-97.7337	-71	26.7337

Sample Calculation dBc = Measured + CF – dBm Power

Margin = Limit dBc - dBc

3.4 Radiated Spurious Emissions

Testing was performed in accordance with FCC Part 2.1053, FCC Part 27.53 (f), and TIA/EIA 603-C .

3.4.1 Test Methodology

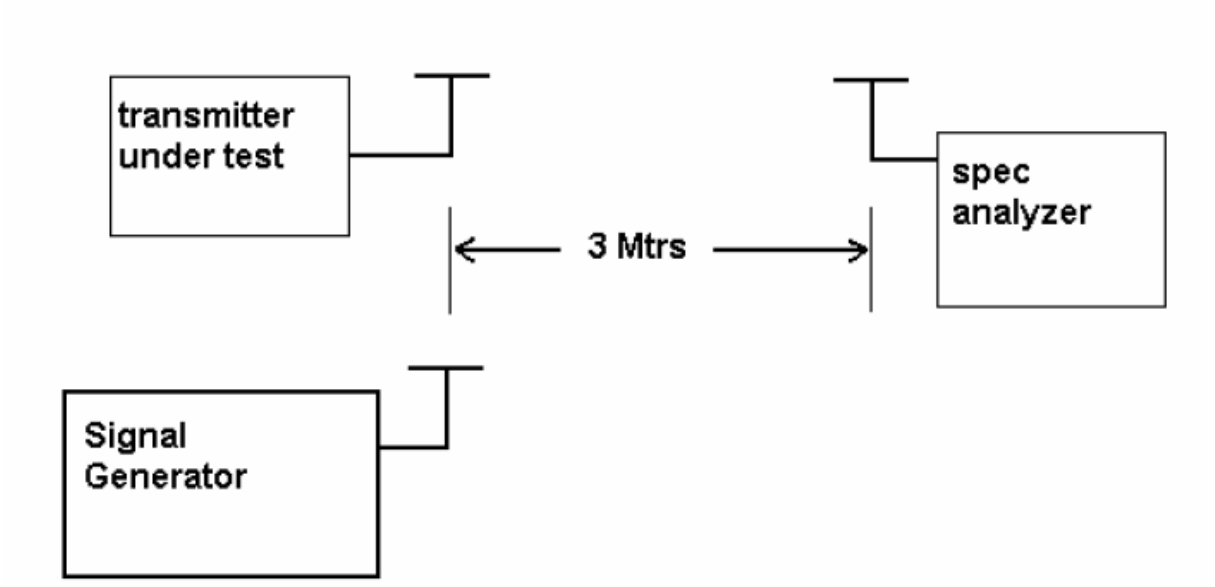
Part 2.1053
Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and

operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

Part 27.53 (f)

For operations in the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

Method of Measuring Radiated Spurious Emissions



Method of Measurements: The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per TIA/EIA STANDARD 603 using the substitution method.

Limit = 43 + 10 log (631)dB = 71

3.4.2 Test Results

Emission Freq (MHz)	ANT Polar (H/V)	FIM Value (dBuV)	PW Drive Level (dBm)	Antenna Gain (dBd)	Power (dBc)	Margin (dB)
1438	H	41.8	-33.89	6.26	-85.63	14.63
2157	H	46	-30.47	6.46	-82.01	11.01
2876	H	47.63	-32.53	7.06	-83.47	12.47
3595	H	27.07	-42.25	7.36	-92.89	21.89
4314	H	34.2	-34.82	8.26	-84.56	13.56
5033	H	21.25	-47.41	8.56	-96.85	25.85
5752	H	25.69	-40.56	8.76	-89.8	18.8
6471	H	20.25	-44.02	9.66	-92.36	21.36
7190	H	28.73	-61.62	9.06	-110.56	39.56
1438	V	47	-30.33	6.06	-82.27	11.27
2157	V	51.47	-22.1	6.76	-73.34	2.34
2876	V	50.5	-21.67	7.06	-72.61	1.61
3595	V	29.45	-40.93	7.56	-91.37	20.37
4314	V	37	-32.55	8.06	-82.49	11.49
5033	V	20.38	-53.97	8.56	-103.41	32.41
5752	V	28.36	-38.74	8.76	-87.98	16.98
6471	V	20.5	-45.93	9.76	-94.17	23.17

Sample Calculation: Power = PW Drive Level + Antenna Gain - 58

Margin = (Power + -71)*-1

3.5 2.1055 Frequency stability

The exciter used with this product has been previously tested. See Harris report for FCCID BOIDVF.

4 Test Equipment Use List

5 Test Equipment usedTest Equipment Use List

5.1 Test Equipment use list

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal dd/mm/yy	Next Cal dd/mm/yy
Conducted Power Output Part 2.1046 (a), (c)					
Meter, RF Power	Boonton	4231A	66801	6-Mar-07	6-Mar-08
Cable, Coax	Andrew	FSJ1-50A	045	30-Jan-2008	30-Jan-2009
Occupied Bandwidth Part 2.1049					
Cable, Coax	Andrew	FSJ1-50A	045	30-Jan-2008	30-Jan-2009
Receiver, EMI	Rohde & Schwarz	ESIB40	100043	12-Jul-2007	12-Jul-2008
Spurious Emissions at Antenna Terminals					
Cable, Coax	Andrew	FSJ1-50A	045	30-Jan-2008	30-Jan-2009
Receiver, EMI	Rohde & Schwarz	ESIB40	100043	12-Jul-2007	12-Jul-2008
Radiated Spurious Emissions					
Antenna Horn 1-18GHz	EMCO	3115	2236	25-Jan-2007	25-Jan-2009
Ant. BiconiLog	Chase	CBL6140A	1108	16-May-2006	16-May-2008
Receiver, EMI	Rohde & Schwarz	ESIB40	100043	12-Jul-2007	12-Jul-2008
Cable, Coax	Andrew	FSJ1-50A	003	30-Jan-2008	30-Jan-2009
Cable, Coax	Andrew	FSJ1-50A	030	30-Jan-2008	30-Jan-2009
Ant. Dipole Set TDS-200	AH Systems	TDS-200/535-3	154	15-Sep-2006	15-Sep-2008
Ant. Dipole Set TDS-200	AH Systems	TDS-200/535-1	154	15-Sep-2006	15-Sep-2008
Ant. Dipole Set TDS-200	AH Systems	TDS-200/535-2	154	15-Sep-2006	15-Sep-2008
Generator, Signal	Hewlett Packard	83630A	3420A00649	8-Mar-2007	8-Mar-2008
General Laboratory Equipment					
Meter, Multi	Fluke	79-3	69200606	3-Dec-07	3-Dec-08
Meter, Temp/Humid/Barom	Fisher	02-400	01	3-Dec-07	3-Dec-08

* Calibration of equipment past due for re-calibration will be performed expeditiously. If any equipment is found to be out of tolerance at that time, affected customers will be notified accordingly.