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Test Report:	2006 090699 CONTROLLER EMC
Project number:	26-699-DIG R2
Applicant:	DIG Corp 1210 Activity Dr. Vista, CA 92081
Equipment Under Test (EUT):	Controller
Model:	LEIT 2
FCC ID:	UJV-LEIT01
In Accordance With:	FCC Part 15 Subpart C, 15.249 CANADA, IC RSS-Gen, IC RSS 210
Tested By:	Nemko USA Inc. 11696 Sorrento Valley Road, Suite F San Diego, CA 92121
Authorized By:	Michael T. Krumweide, EMC Supervisor
Date:	October 27, 2006
Total Number of Pages:	24

Section 1. Summary of Test Results

General

All measurements are traceable to national standards

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15; Subpart C. Radiated tests were conducted is accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

This Radio Standards Specification (RSS) sets out the requirements for license exempt low-power intentional radiators. The applicable standard for low-power intentional radiators in Canada, corresponding to FCC Part 15 Subpart C, is RSS-210. The two are very closely harmonized in terms of permitted frequencies, types of operation, and other technical requirements. The test results reported in this report are deemed satisfactory evidence of compliance with Industry Canada Standard RSS-210.

The assessment summary is as follows:

Apparatus Assessed: LEIT 2 Controller

Specification: FCC Part 15 Subpart C, 15.249
IC RSS-Gen, IC RSS 210

Compliance Status: Complies

Exclusions: None

Non-compliances: None

Report Release History:

REVISION	DATE	COMMENTS
-	10-27-2006	Prepared By: Ferdinand S. Custodio
-	10-27-2006	Initial Release: Mike T. Krumweide

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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TESTED BY: _____ Date: October 27, 2006
Ferdinand S. Custodio, EMC Test Engineer

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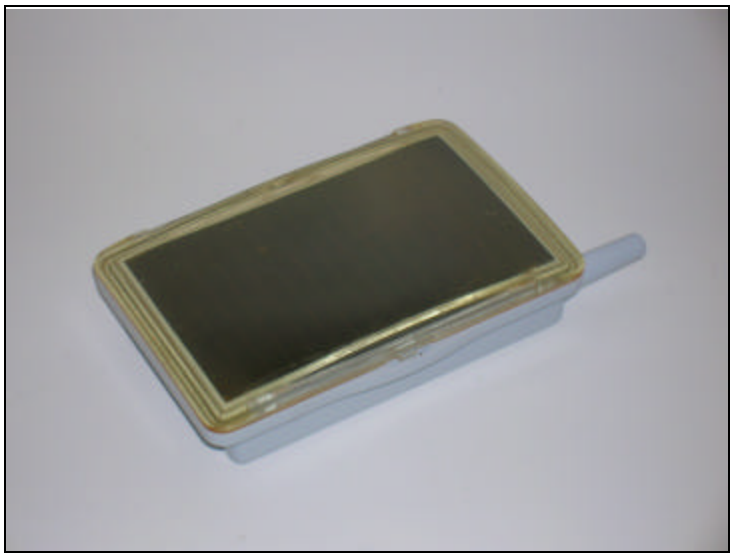
Section 2: Equipment Under Test

2.1 Product Identification

The Equipment Under Test was identified as follows:

LEIT 2 Controller

Engineering sample, serial number not available during assessment



2.2 Samples Submitted for Assessment

The following samples of the apparatus have been submitted for type assessment:

Sample No.	Description	Serial No.
26-699-DIGR1 Controller US	LEIT 2 Controller (US version)	NA

2.3 Theory of Operation

The LEIT 2 Controller is a solar power, radio controller irrigation controller. Its function is to actuate a solenoid to turn on/off irrigation valves. All power comes from the sun. The energy collected by the PVM (photo voltaic module – the solar cell) is stored in super capacitors. The controller is controlled via a wireless handset where all functions of the EUT are set.

2.4 Technical Specifications of the EUT

Manufacturer:	DIG Corporation
Operating Frequency:	920MHz Only
Emission Designator	78K0F1D
Rated Power:	0.7032mW
Modulation:	FSK
Type of Receiver:	Low IF Receiver
Antenna Data:	Integral
Power Source:	Super capacitor charged via photo voltaic modules

Section 3: Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.249
Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz and 24.0-24.25 GHz bands.

RSS-Gen Genral Requirements and Information for the Certification of Radiocommunication Equipment

RSS-210 Low-power License–exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

3.2 Deviations From Laboratory Test Procedures

No deviations from Laboratory Test Procedure

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15 – 30 ^{o}C
Humidity range	:	20 - 75 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages
Temperature	:	-20 to +55 ^{o}C (General)
Voltage	:	NiMH battery: 3.6VDC (Handset) Super Capacitor: 4.2V to 7.5VDC (Controller)

3.4 Test Equipment

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
877	Antenna, DRG Horn	AH Systems	2882	688	6/20/06	6/20/07
110	Antenna, LPA	Electrometrics	LPA-25	1217	11/29/05	11/29/06
835	Spectrum Analyzer	Rohde & Schwarz	RHDFSEK	829058/005	1/18/06	01/18/07
911	Spectrum Analyzer	Agilent	E4440A	US41421266	6/7/06	6/7/07
N149	Environmental Chamber	Cincinnati Sub-Zero	ZPHS-32-2-2-H/AC	ZP0552665	5/11/06	5/11/07
842	Preamp	Nemko	Nemko	NA	9/12/06	Verified
114	Antenna, Bicon	EMCO	3104	2997	12/7/2005	12/07/06
827	Preamplifier	Com-Power	PA-103	161032	1/11/2006	01/11/07
901	pre amp	Sonoma	310 N	130607	12/19/05	12/19/06
128	Antenna, Bicon	EMCO	3104	2882	10/6/05	10/6/06

Section 4: Observations

4.1 Modifications Performed During Assessment

Duty cycle was adjusted from 22% to 100% to aid Radiated Emissions measurements as needed.

4.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

4.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

4.4 Test Deleted

No Tests were deleted from this assessment.

4.5 Additional Observations

There were no additional observations made during this assessment.

Section 5: Results Summary

This section contains the following:

FCC Part 15 Subpart C: Test Results and corresponding IC RSS-210 equivalent.

The column headed "Required" indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No: not applicable / not relevant
Y Yes: Mandatory i.e. the apparatus shall conform to these test.
N/T Not Tested, mandatory but not assessed. (See section 4.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

5.1 FCC Part 15 Subpart C and IC RSS-210 Equivalent: Test Results

Part 15	Test Description	Required	Result
15.207 (a)	Powerline Conducted Emissions	N	
15.209 (a) *IC RS-210 2.2/2.7*	Radiated Emissions within Restricted Bands	Y	Pass
15.215 (c) *IC RS-Gen 4.4.1*	Occupied Bandwidth	Y	Pass
15.249 (a) *IC RS-210 A2.9*	Radiated Emissions not in Restricted Bands	Y	Pass
15.249 (b)	Fixed Point-to-Point operation in the 24.0-24.25 GHZ Band	N	
15.249 (d) *IC RS-210 2.6*	Spurious Emissions (except Harmonics)	Y	Pass
2.1055 (a) *IC RS-210 2.1,IC RS-Gen 4.5*	Frequency Stability	Y	Pass

Notes:

Spurious Emissions was measured when the unit is in "Listen" mode to show compliance with IC RSS General Receiver requirements, however no emissions were detected and with the same results as Part 12.249 (d) measurements.

Appendix A: Test Results

Clause 15.209(a) Radiated Emissions within Restricted Bands

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (uV/meter)	Measurement Distance (meter)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	3
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Conditions:

Sample Number:	Controller US	**Temperature:**	25
Date:	9/12/2006	**Humidity:**	58
Modification State:	Loop transmission	**Tester:**	Ferdinand Custodio
		Laboratory:	OATS

Test Results:

See Attached Plots.

Additional Observations:

The Spectrum was searched from 30MHz to the 10th Harmonic.

These results apply to emissions found in the restricted bands defined in FCC Part 15 Subpart C, 15.205.

The EUT was measured on three orthogonal axes. The EUT was tested with freshly charged Super Capacitors.

All Measurements (including above 1GHz) were performed at 3m with a Peak detector of 1MHz RBW/VBW.

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Radiated Emissions Data

Complete X
Preliminary

Job # : 26-699-DIG Test # :
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Client Name : DIG Corp.
EUT Name : LEIT II
EUT Model # : Controller 920MHz
EUT Part # :
EUT Serial # :
EUT Config. : Running loop transmission routine

Specification : FCC Part 15.209 (a) Restricted Bands
Reference :

Rod. Ant. #: NA
Bicon Ant.#:
Log Ant.#: NA
DRG Ant. # 877
Dipole Ant.#: NA
Cable#: 40FT
Preamp#: 842
Spec An.#: 911
QP #: 911
PreSelect#: NA

Temp. (deg. C) : 25
Humidity (%) : 58
EUT Voltage :
EUT Frequency :
Phase:
Location: SOATS
Distance: 3 meters

Date : 9/12/2006
Time :
Staff : FSCustodio

Quasi-Peak RBW:	120 kHz
Video Bandwidth	120 kHz
Average RBW:	1 MHz
Video Bandwidth	10 Hz
Peak RBW:	1 MHz
Video Bandwidth	1 MHz

Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.
Measurements above 1 GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
2760.00	V		63.8	29.3	4.0	48.3	48.8	54.0	-5.2	Pass	
2760.00	H		61.5	29.3	4.0	48.3	46.5	54.0	-7.5	Pass	
3680.00	V		52.3	30.9	5.4	45.8	42.8	54.0	-11.2	Pass	
3680.00	H		49.75	30.9	5.4	45.8	40.2	54.0	-13.8	Pass	
4600.00	V		47.5	33.9	6.0	44.2	43.2	54.0	-10.8	Pass	
4600.00	H		45.3	33.9	6.0	44.2	41.0	54.0	-13.0	Pass	

Measurement done with 1MHz RBW and 1MHz VBW (Peak)

IC RS-210 2.2/2.7 Radiated Emissions within Restricted Bands

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Radiated Emissions Data

Complete X Job # : 26-699-DIG Test # :
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Client Name : DIG Corp.
EUT Name : LEIT II
EUT Model # : Controller 920MHz
EUT Part # :
EUT Serial # :
EUT Config. : Running loop transmission routine
RSS Gen Restricted Bands
Specification : FCC Part 15.249 Reference :

Rod. Ant. #:	NA	Temp. (deg. C) :	25	Date :	10/27/2006
Bicon Ant.#:		Humidity (%) :	58	Time :	
Log Ant.#:	NA	EUT Voltage :		Staff :	FSCustodio
DRG Ant. #	877	EUT Frequency :		Quasi-Peak RBW:	120 kHz
Dipole Ant.#:	NA	Phase:		Video Bandwidth	120 kHz
Cable#:	40FT	Location:	SOATS	Average RBW:	1 MHz
Preamp#:	842	Distance:	3 meters	Video Bandwidth	10 Hz
Spec An.#:	911			Peak RBW:	1 MHz
QP #:	911			Video Bandwidth	1 MHz
PreSelect#:	NA				

Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.
Measurements above 1 GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
2760.00	V		63.8	29.3	4.0	48.3	48.8	54.0	-5.2	Pass	
3680.00	V		52.3	30.9	5.4	45.8	42.8	54.0	-11.2	Pass	
4600.00	V		47.5	33.9	6.0	44.2	43.2	54.0	-10.8	Pass	
7360.00				36.8	9.6	42.5	3.9	54.0	-50.1	Pass	Noise Floor
8280.00				37.3	10.0	41.9	5.4	54.0	-48.6	Pass	Noise Floor
9200.00				37.7	10.5	39.0	9.2	54.0	-44.8	Pass	Noise Floor

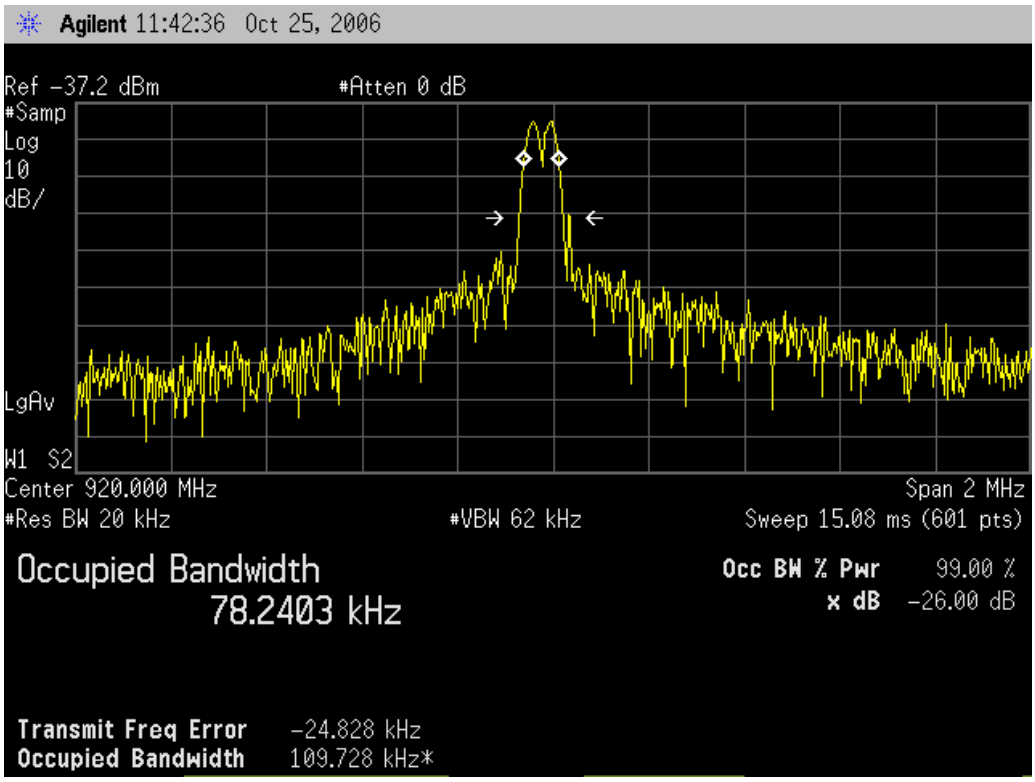
Clause 15.215(c) Occupied Bandwidth

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Sec. Sec. 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Test Conditions:

Sample Number:	Controller US	**Temperature:**	22
Date:	10/27/2006	**Humidity:**	44
Modification State:	Loop transmission	**Tester:**	Ferdinand Custodio
		Laboratory:	Shield Room 2

Test Results:



Notes:

Clause 15.249(a) Radiated Emissions not in Restricted Bands

Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency (MHz)	Field strength of fundamental (mV/meter)	Field strength of harmonics (uV/meter)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

Test Conditions:

Sample Number:	Controller US	**Temperature:**	25
Date:	9/12/2006	**Humidity:**	58
Modification State:	Loop transmission	**Tester:**	Ferdinand Custodio
		Laboratory:	OATS

Test Results:

See Attached Plots.

Additional Observations:

The Spectrum was searched from 30MHz to the 10th Harmonic.

The EUT was measured on three orthogonal axes. The EUT was tested with freshly charged Super Capacitors.

All Measurements (including above 1GHz) were performed at 3m with a Peak detector of 1MHz RBW/VBW.

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Radiated Emissions Data

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Preliminary

Job # : 26-699-DIG Test # :
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Client Name : DIG Corp.
EUT Name : LEIT II
EUT Model # : Controller 920MHz
EUT Part # :
EUT Serial # :
EUT Config. : Running loop transmission routine

Specification : FCC Part 15.249 (a) Not in Restricted Bands
Reference :

Rod. Ant. #: NA
Bicon Ant.#:
Log Ant.#: 110
DRG Ant. # 877
Dipole Ant.#: NA
Cable#: 40FT
Preamp#: 842
Spec An.#: 911
QP #: 911
PreSelect#: NA

Temp. (deg. C) : 25
Humidity (%) : 58
EUT Voltage :
EUT Frequency :
Phase:
Location: SOATS
Distance: 3 meters

Date : 9/12/2006
Time :
Staff : FSCustodio

Quasi-Peak RBW:	120 kHz
Video Bandwidth	120 kHz
Average RBW:	1 MHz
Video Bandwidth	10 Hz
Peak RBW:	1 MHz
Video Bandwidth	1 MHz

Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.
Measurements above 1 GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Antenna used	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
920	V	110	57.49	22.4	5.6	0.0	85.5	94.0	-8.5	Pass	
920	H	110	65.71	22.4	5.6	0.0	93.7	94.0	-0.3	Pass	
1840.00	V	877	63.4	24.8	2.0	48.4	41.8	54.0	-12.2	Pass	
1840.00	H	877	61.35	24.8	2.0	48.4	39.7	54.0	-14.3	Pass	
5520.00	V	877	46.9	35	7.4	43.3	46.0	54.0	-8.0	Pass	
5520.00	H	877	45.3	35	7.4	43.3	44.4	54.0	-9.6	Pass	
6440.00	V	877		35.7	8.2	42.7	1.2	54.0	-52.8	Pass	Noise floor
6440.00	H	877		35.7	8.2	42.7	1.2	54.0	-52.8	Pass	Noise floor
10120.00	V	877		38.6	11.2	35.9	13.9	54.0	-40.1	Pass	Noise floor
10120.00	H	877		38.6	11.2	35.9	13.9	54.0	-40.1	Pass	Noise floor

Clause 15.249(d) Spurious Emissions (except Harmonics)

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Sec. 15.209, whichever is the lesser attenuation.

Test Conditions:

Sample Number:	Controller US	**Temperature:**	22
Date:	9/14/2006	**Humidity:**	55
Modification State:	Loop transmission	**Tester:**	Ferdinand Custodio
		Laboratory:	OATS

Test Results:

See Attached Plots.

Additional Observations:

The Spectrum was searched from 30MHz to the 10th Harmonic.

The EUT was measured on three orthogonal axes. The EUT was tested with freshly charged Super Capacitors.

All Measurements were performed at 3m with a Quasi-Peak detector below 1GHz and a Peak detector of 1MHz RBW/VBW above 1GHz.

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Radiated Emissions Data

Complete X Job # : 26-699-DIG Test # :
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Client Name : DIG Corp.
EUT Name : LEIT II
EUT Model # : Controller 920MHz
EUT Part # :
EUT Serial # :
EUT Config. : Running loop transmission routine

Specification : CFR47 Part 15, Subpart B, Class B Reference :
Rod. Ant. #: NA Temp. (deg. C) : 22 Date : 9/14/2006
Bicon Ant.#: 128 Humidity (%) : 55 Time :
Log Ant.#: 110 EUT Voltage : Staff : FSCustodio
DRG Ant. # 877 EUT Frequency :
Dipole Ant.#: NA Phase:
Cable#: NOATS Location: NOATS
Preamp#: 901 842 Distance: 3 meters
Spec An.#: 911
QP #: 911
PreSelect#: NA

Quasi-Peak RBW:	120 kHz
Video Bandwidth	120 kHz
Average RBW:	1 MHz
Video Bandwidth	10 Hz
Peak RBW:	1 MHz
Video Bandwidth	1 MHz

Measurements below 1 GHz are Quasi-Peak values, unless otherwise stated.
Measurements above 1 GHz are Average values, unless otherwise stated.

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
30.93	V		47.79	13	1.0	31.8	29.9	40.0	-10.1	Pass	Ambient Noise
73.35	V		52.19	8.4	1.5	32.0	30.1	40.0	-9.9	Pass	Ambient Noise
149.42	V		43.99	12.5	1.8	31.9	26.4	43.5	-17.1	Pass	Ambient Noise
169.90	V		37.29	15.4	2.2	32.0	22.9	43.5	-20.6	Pass	Ambient Noise
200.00	H		39.39	11.6	2.5	31.9	21.5	43.5	-22.0	Pass	Noise Floor
470.17	H		31.79	17.3	3.8	31.8	21.1	46.0	-24.9	Pass	Noise Floor
653.33	H		31.99	20.3	4.8	32.1	25.0	46.0	-21.0	Pass	Noise Floor
950.00	H		32.79	23.4	6.0	31.7	30.6	46.0	-15.5	Pass	Noise Floor

Clause 2.1055(a) Frequency Stability

(a) The frequency stability shall be measured with variation of ambient temperature as follows:
(1) From -30[deg] to +50[deg] centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

Test Conditions:

Sample Number:	Controller US	**Temperature:**	25
Date:	9/13/2006	**Humidity:**	56
Modification State:	Loop transmission	**Tester:**	Ferdinand Custodio
		Laboratory:	Humidity Chamber

Test Results:

4900 Hz difference, which corresponds to 5.326 ppm
Limit = 100 ppm

See Attached Plots.

Part 2.1055 (-30°C to +50°C)
Spectrum Analyzer @ 100KHz RBW, 1MHZ RBW, 1MHz Span **LEIT II Controller**
Worst case variation: **4900.0 Hz (>Set freq.)** **Set Frequency: 919.9941 MHz @ 20°C**
3300.0 Hz (<Set freq.)

Temp.Set Point Temp.Actual	Time	**85% of Vnom** Frequency ? (MHz) Difference (MHz)	**Vnom=Internal Battery** Frequency ? (MHz) Difference (MHz)	**115% of Vnom** Frequency ? (MHz) Difference (MHz)
-30 -29.8	8:30AM		919.998 0.003900000	
-20 -19.9	9:30AM		919.998 0.003900000	
-10 -10	10:30AM		919.998 0.003900000	
0 0	11:30AM		919.999 0.004900000	
10 10.1	12:30PM		919.9983 0.004200000	
20 20.2	1:30PM		919.9983 0.004200000	
30 29.9	2:30PM		919.9941 0.000000000	
40 40	3:30PM		919.9966 0.002500000	
50 50	4:30PM		919.9908 0.003300000	

Appendix B: Setup Photographs

Radiated Emissions Setup:

Spurious Emissions Setup:

Appendix C: Block Diagram of Test Setups

Test Site For Radiated Emissions