



Nemko

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CERTIFICATION TEST REPORT

Report Number: 2009 05126317 FCC

Project Number: 18483-1

Nex Number: 126317

Applicant: DIG CORPORATION
1210 ACTIVITY DRIVE
VISTA, CA 92081

Equipment Under Test (EUT): WIRELESS WEATHER STATION

Model: LEIT ET-WWS

FCC ID: UJV-LEIT03

IC: 6694A-LEIT03

In Accordance With: FCC Part 15 Subpart C, 15.249
IC RSS-210 Issue 7 June 2007

Tested By: Nemko USA Inc.
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San Diego, CA 92121

Authorized By: Alan Laudani, EMC/RF Test Engineer

Date: May 25, 2009

Total Number of Pages: 20



Section1: 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 FCC Part 15; Subpart C and IC RSS-210. Radiated tests were conducted in 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 and IC.

The assessment summary is as follows:

Apparatus Assessed: Wireless Weather Station

Model: Leit ET-WWS

Specification: FCC Part 15 Subpart C, 15.249
IC RSS-210 Issue 7 June 2007 A2.9

Date Received in Laboratory: April 15, 2009

Compliance Status: Complies

Exclusions: None

Non-compliances: None



1.1 Report Release History

| REVISION | DATE | COMMENTS | |
|----------|--------------|------------------|--------------------|
| - | May 25, 2009 | Prepared By: | Ferdinand Custodio |
| - | May 25, 2009 | Initial Release: | Alan Laudani |

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:


Ferdinand Custodio, EMC Test Engineer

Date: May 25, 2009

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Section 2: Equipment Under Test

2.1 Product Identification

The Equipment Under Test was indentified as follows:

LEIT ET-WWS WIRELESS WEATHER STATION

Production sample, serial number not available during assessment:



2.2 Samples Submitted for Assessment

The following sample of the apparatus has been submitted for type assessment:

| Sample No. | Description | Serial No. |
|------------|--------------------------|------------|
| 126317-1 | WIRELESS WEATHER STATION | N/A |



2.3 Theory of Operation

The Leit ET-WWS is a Wireless Weather Station. Its function is a solar powered weather station that accumulates every half hour the temperature, wind speed, humidity, solar radiation, rain levels to calculate an evapotranspiration value to transmit to a nearby wireless irrigation controller. Normally the duty cycle is to transmit twice every hour, but for testing purposes it will be modified to transmit all the time.

2.4 Technical Specifications of the EUT

| | |
|---|------------------------------------|
| Manufacturer: | DIG Corporation |
| Operating Frequency: | 920 MHz in the 902 to 928 MHz Band |
| Number of Operating Frequencies: | 1 |
| Rated Power: | 72.4 dB μ V/m @ 3 m |
| Modulation: | FSK |
| Antenna Connector: | Internal/Integral |
| Power Source: | 5VDC (Super Capacitor) |



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.

IC RSS-210 Issue 7 June 2007

Low-power Licence-exempt Radio-communication Devices (All Frequency Bands): Category I Equipment. Annex 8 - Frequency Hopping and Digital Modulation Systems Operating in the Bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

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 | : | 14 - 21 °C |
| Humidity range | : | 41 - 45 % |
| Pressure range | : | 100.9 - 101.2 kPa |
| Power supply range | : | 5VDC (to charge Super Capacitor when testing indoor) |

3.4 Test Equipment

| Nemko ID | Device | Manufacturer | Model | Serial Number | Cal Date | Cal Due Date |
|----------|----------------------------------|--------------------------------|-----------------|--------------------------------------|------------------------|--------------|
| 956 | Attenuator Set | Narda | 118A/4 | 33693 | 21-Jan-09 | 21-Jan-10 |
| 936 | DC Power Supply 0-50V 0-10A 200W | Hewlett Packard | 6002A | N/A | Verified by Asset #815 | |
| 815 | Multimeter | Fluke | 111 | 78130066 | 16-Jul-08 | 16-Jul-09 |
| 111 | Antenna, LPA | EMCO | 3146 | 1382 | 20-Oct-08 | 20-Oct-10 |
| 128 | Antenna, Bicon | EMCO | 3104 | 2882 | 09-Feb-09 | 09-Feb-11 |
| 529 | Antenna, DRWG | EMCO | 3115 | 2505 | 30-Sep-08 | 30-Sep-10 |
| 911 | Spectrum Analyzer | Agilent | E4440A | US4142126 6 | 06-Nov-08 | 06-Nov-09 |
| 902 | pre amp | Sonoma | 310 N | 185803 | 17-Jul-08 | 17-Jul-09 |
| 919 | Preamplifier | Spacek Labs MM-Wave Technology | 100MHz to 40GHz | 3M12 (SLK-35-3) and 3M13 (SLKa-35-4) | 10-Nov-08 | 11-Nov-09 |

2040B-1 OATS



Section 4: Observations

4.1 Modifications Performed During Assessment

No modifications were performed during assessment.

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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

§ 15.249 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.

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 Test Results

| Part 15C/RSS-210 | Test Description | Required | Result |
|------------------|--|----------|--------|
| 15.207 | Power Lines Conducted Emissions | N | - |
| 15.209 (a) | Radiated Emissions within Restricted Bands | Y | Pass |
| 15.215 (c) | Occupied Bandwidth | Y | Pass |
| 15.249(a) | Radiated Emissions not in Restricted Bands | Y | Pass |
| 15.249(b) | Operation in the 2400-2483.5 MHZ Band Fixed, point-to-point operation | N | |
| 15.249(d) | Spurious Emissions (except Harmonics) | Y | Pass |
| A2.9 | Annex 2 - Devices Operating in Frequency Bands for Any Application A2.9 902-928, 2400-2483.5 and 5725-5875 MHz | Y | Pass |



Appendix A: Test Results

Section 15.215 (c) Occupied Bandwidth

15.215(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§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: | Leit ET-WWS | Temperature: | 21°C |
| Date: | April 20, 2009 | Humidity: | 45% |
| Modification State: | Carrier Frequency | Tester: | FSCustodio |
| | | Laboratory: | Shield Room #1 |

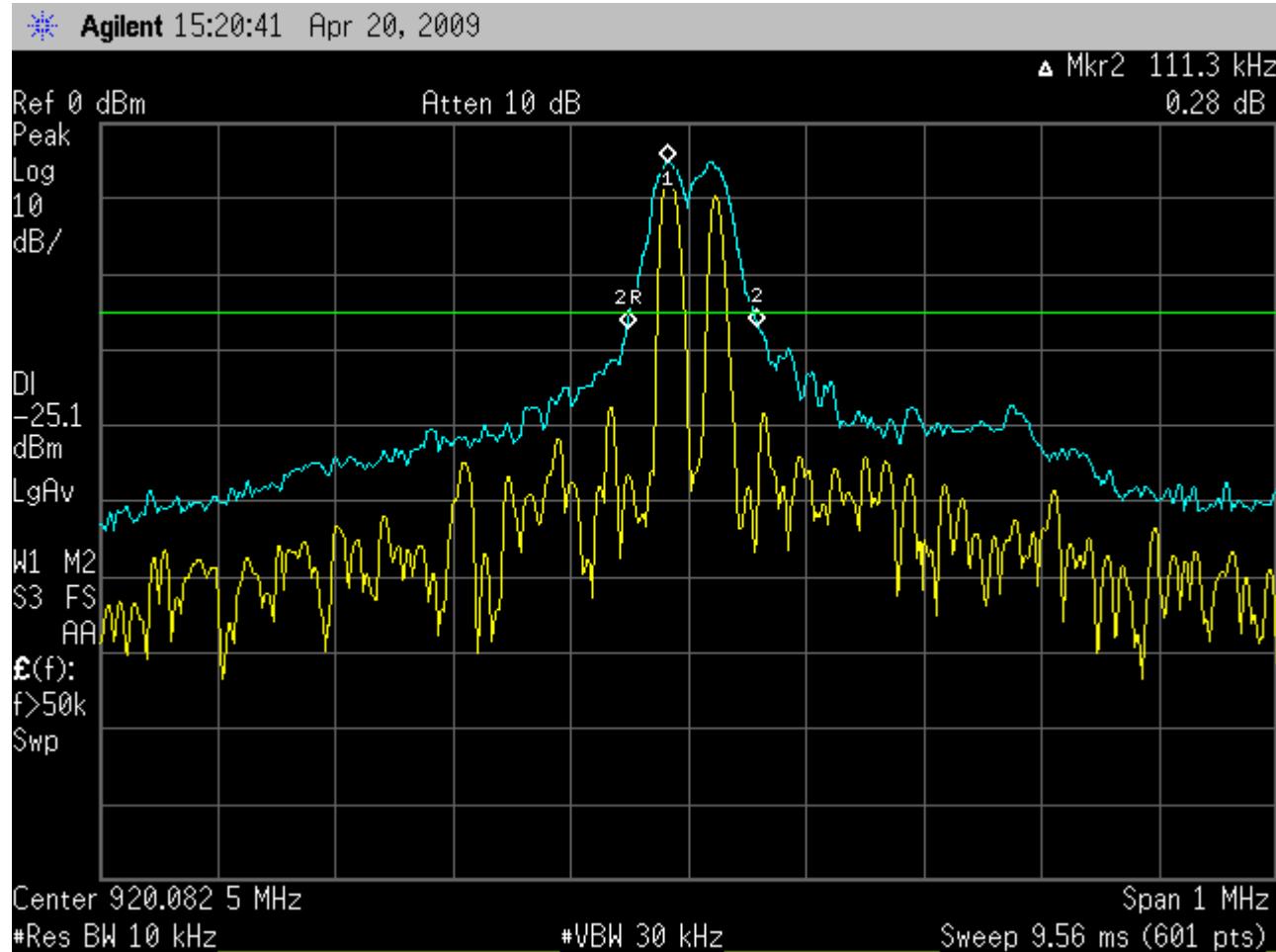
Test Results:

See attached plots.

Additional Observations:

- Measurements were made at 1 meter. The spectrum analyzer center frequency was set to the channel carrier. After a PEAK output max hold reading was taken, a line was drawn 20 dB lower than PEAK level. The bandwidth was determined from where the channel output spectrum intersected the display line.
- Analyzer RES BW was set to 1% of the span while VBW is set at 3 times the RBW.

| Frequency | 20 dB Bandwidth |
|-----------|-----------------|
| 920 MHz | 111.3 kHz |



**Clause 15.249(a) Radiated Emissions**

(a) 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 | Field strength of fundamental (millivolts/meter) | Field strength of harmonics (microvolts/meter) |
|-----------------------|--|--|
| 902–928 MHz | 50 | 500 |
| 2400–2483.5 MHz | 50 | 500 |
| 5725–5875 MHz | 50 | 500 |
| 24.0–24.25 GHz | 250 | 2500 |

Test Conditions:

| | | | |
|----------------------------|-------------------|---------------------|------------|
| Sample Number: | Leit ET-WWS | Temperature: | 14°C |
| Date: | April 15, 2009 | Humidity: | 41% |
| Modification State: | Carrier Frequency | Tester: | FSCustodio |
| | | Laboratory: | SOATS |

Test Results:

See attached plots.

Additional Observations:

- The Spectrum was searched from 30MHz to the 10th Harmonic.9200 MHz
- The EUT was tested with freshly charged Super Capacitor.
- Fundamental and harmonic emissions.

Sample Computations:

$$\begin{aligned} \text{Correction factor @ 920 MHz} &= -3.7 \\ &= \text{Antenna factor + Cable loss - Preamp gain} \\ &= 23.5 + 4.4 - 31.6 \\ \text{Corrected reading} &= \text{Max. reading + Correction factor} \\ &= 76.1 + (-3.7) \\ &= 72.4 \text{ dB}\mu\text{V/m} \end{aligned}$$



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| | | | | | | | |
|-----------------|-----------------------------------|---------------------|------------|----------------------|------|----|---|
| Job #: | 18483-1 | Date : | 04/15/2009 | Page | 1 | of | 1 |
| NEX #: | 126317 | Time : | 11AM | | | | |
| Client Name : | DIG Corporation | Staff : | FSC | | | | |
| EUT Name : | Wireless Weather Station | | | EUT Voltage : | 5VDC | | |
| EUT Model #: | Leit ET-WWS | | | EUT Frequency : | | | |
| EUT Serial #: | N/A | | | Phase: | | | |
| EUT Config.: | Continuous transmit @ max power | | | NOATS | | | |
| Specification : | CFR47 Part 15, Subpart B, Class B | | | SOATS | | | |
| Loop Ant. #: | NA | | | Distance < 1000 MHz: | 3 m | | |
| Bicon Ant. #: | 128_3m | Temp. (°C) : | 14 | Distance > 1000 MHz: | 3 m | | |
| Log Ant. #: | 111_3m | Humidity (%) : | 41 | | | | |
| DRG Ant. # | 529 | Spec An. #: | 911 | | | | |
| Cable LF#: | SOATS | Spec An. Display #: | NA | | | | |
| Cable HF#: | SOATS | QP #: | 911 | | | | |
| Preamp LF#: | 902 | PreSelect#: | NA | | | | |
| Preamp HF#: | 919 | | | | | | |

| | |
|------------|-------------------------|
| Quasi-Peak | RBW: 120 kHz |
| | Video Bandwidth 300 kHz |
| Peak | RBW: 1 MHz |
| | Video Bandwidth 3 MHz |
| Average | RBW: 1 MHz |
| | Video Bandwidth 10 Hz |

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

Measurements above 1 GHz are Average values, unless otherwise stated.

| Meas. Freq. (MHz) | Meter Reading Vertical | Meter Reading Horizontal | Det. | EUT Side F/L/R/B | Ant. Height m | Max. Reading (dB μ V) | Corrected Reading (dB μ V/m) | Spec. limit (dB μ V/m) | CR/SL Diff. (dB) | Pass Fail | Comment |
|-------------------|------------------------|--------------------------|------|------------------|---------------|---------------------------|----------------------------------|----------------------------|------------------|-----------|---------|
| 920.0 | 75.1 | 76.1 | Q | F | 1.2 | 76.1 | 72.4 | 94.0 | -21.6 | Pass | |
| 1840.0 | 53.3 | 52.7 | P | F | 1.1 | 53.31 | 51.8 | 74.0 | -22.1 | Pass | |
| 1840.0 | 46.2 | 48.9 | A | F | 1.1 | 48.93 | 47.5 | 54.0 | -6.5 | Pass | |
| 2760.0 | 58.6 | 60.9 | P | F | 1.1 | 60.87 | 62.6 | 74.0 | -11.3 | Pass | |
| 2760.0 | 51.8 | 50.5 | A | F | 1.1 | 51.8 | 53.6 | 54.0 | -0.4 | Pass | |
| 3680.0 | 47.8 | 44.8 | P | F | 1.1 | 47.75 | 51.3 | 74.0 | -22.7 | Pass | |
| 3680.0 | 37.1 | 31.5 | A | F | 1.1 | 37.07 | 40.6 | 54.0 | -13.3 | Pass | |
| 4600.0 | 44.5 | 43.3 | P | F | 1.1 | 44.48 | 49.2 | 74.0 | -24.7 | Pass | |
| 4600.0 | 33.0 | 30.9 | A | F | 1.1 | 33.04 | 37.8 | 54.0 | -16.2 | Pass | |
| | | | | | | | | | | | |

**Clause 15.249(d) Spurious Emissions**

15.249(d) 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 §15.209, whichever is the lesser attenuation.

Test Conditions:

| | | | |
|----------------------------|-------------------|---------------------|------------|
| Sample Number: | Leit ET-WWS | Temperature: | 14°C |
| Date: | April 15, 2009 | Humidity: | 41% |
| Modification State: | Carrier Frequency | Tester: | FSCustodio |

Laboratory: SOATS**Test Results:**

See attached plots.

Additional Observations:

- The Spectrum was searched from 30MHz to the 10th Harmonic.
- The EUT was tested with freshly charged Super Capacitor.
- Non-radio spurious emissions.

Sample Computations:

$$\begin{aligned} \text{Correction factor @ 520 MHz} &= -9.2 \\ &= \text{Antenna factor + Cable loss - Preamp gain} \\ &= 19 + 3.1 - 31.3 \\ \text{Corrected reading} &= \text{Max. reading + Correction factor} \\ &= 39.89 + (-9.2) \\ &= 30.7 \text{ dB}\mu\text{V/m} \end{aligned}$$



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| | | | | | | | |
|-----------------|-----------------------------------|----------------------|------------|------|---|----|---|
| Job #: | 18483-1 | Date : | 04/15/2009 | Page | 1 | of | 1 |
| NEX #: | 126317 | Time : | 11AM | | | | |
| Staff : | FSC | | | | | | |
| Client Name : | DIG Corporation | EUT Voltage : | 5VDC | | | | |
| EUT Name : | Wireless Weather Station | EUT Frequency : | | | | | |
| EUT Model #: | Leit ET-WWS | Phase: | | | | | |
| EUT Serial #: | N/A | NOATS | | | | | |
| EUT Config.: | Continuous transmit @ max power | SOATS | | | | | |
| Specification : | CFR47 Part 15, Subpart B, Class B | Distance < 1000 MHz: | 3 m | | | | |
| Loop Ant. #: | NA | Distance > 1000 MHz: | 3 m | | | | |
| Bicon Ant. #: | 128 3m | Temp. (°C) : | 14 | | | | |
| Log Ant. #: | 111 3m | Humidity (%) : | 41 | | | | |
| DRG Ant. # | 529 | Spec An. #: | 911 | | | | |
| Cable LF#: | SOATS | Spec An. Display #: | NA | | | | |
| Cable HF#: | SOATS | QP #: | 911 | | | | |
| Preamp LF#: | 902 | PreSelect#: | NA | | | | |
| Preamp HF# | 919 | | | | | | |

| | |
|------------|-------------------------|
| Quasi-Peak | RBW: 120 kHz |
| | Video Bandwidth 300 kHz |
| Peak | RBW: 1 MHz |
| | Video Bandwidth 3 MHz |
| Average | RBW: 1 MHz |
| | Video Bandwidth 10 Hz |

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

Measurements above 1 GHz are Average values, unless otherwise stated.

| Meas. Freq. (MHz) | Meter Reading Vertical | Meter Reading Horizontal | Det. | EUT Side F/L/R/B | Ant. Height m | Max. Reading (dB μ V) | Corrected Reading (dB μ V/m) | Spec. limit (dB μ V/m) | CR/SL Diff. (dB) | Pass Fail | Comment |
|-------------------|------------------------|--------------------------|------|------------------|---------------|---------------------------|----------------------------------|----------------------------|------------------|-----------|-----------------|
| 104.0 | 29.7 | 52.6 | Q | R | 1.0 | 52.59 | 33.0 | 43.5 | -10.5 | Pass | with FM ambient |
| 208.0 | 38.3 | 43.7 | Q | L | 1.0 | 43.71 | 25.8 | 43.5 | -17.7 | Pass | |
| 507.0 | 35.4 | 29.0 | Q | F | 1.0 | 35.36 | 25.5 | 46.0 | -20.5 | Pass | |
| 520.0 | 39.9 | 38.9 | Q | R | 1.0 | 39.89 | 30.7 | 46.0 | -15.3 | Pass | |
| | | | | | | | | | | | |

**A2.9 902-928, 2400-2483.5 and 5725-5875 MHz**

This section provides standards for low-power devices that can be used for any application provided the following conditions are met:

(a) The field strengths measured at 3 metres shall not exceed the following:

| Fundamental Frequencies (MHz) | Field Strength (millivolts/m) | |
|-------------------------------|-------------------------------|-----------|
| | Fundamental | Harmonics |
| 902-928 | 50 ^(Note 1) | 0.5 |
| 2400-2483.5 | 50 ^(Note 1) | 0.5 |
| 5725-5875 | 50 ^(Note 1) | 0.5 |

Note 1: Equivalent to 0.75 mW e.i.r.p.

(b) 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 Table 2 limits, whichever is the less stringent.

Test Conditions:

| | | | |
|----------------------------|-------------------|---------------------|------------|
| Sample Number: | Leit ET-WWS | Temperature: | 14°C |
| Date: | April 15, 2009 | Humidity: | 41% |
| Modification State: | Carrier Frequency | Tester: | FSCustodio |
| | | Laboratory: | SOATS |

Test Results:

Same as Clause 15.249(a) Radiated Emissions test results

Additional Observations:

- No emissions found on the band edges (902MHz and 928MHz).



Appendix C: Block Diagram of Test Setups

Test Site For Radiated Emissions

