

DATE: 13 April 2010

I.T.L. (PRODUCT TESTING) LTD.

FCC Radio Test Report

for


Fourier Systems Ltd.

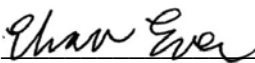
Equipment under test:

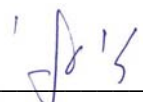
DataNet RH/Temp Logger

DNL920-PA, DNL910-PA*

* See customer's declaration on page 6.

Written by: 
D. Shidlow, Documentation

Approved by: 
E. Ever, Test Engineer

Approved by: 
I. Raz, EMC Laboratory Manager

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This report relates only to items tested.

Measurement/Technical Report for Fourier Systems Ltd.

DataNet RH/Temp Logger

DNL920-PA

FCC ID: XGO-DNL9XX-PA

IC: 8833A-DNL920-PA

This report concerns: Original Grant: X
Class I Change:
Class II Change:

Equipment type: Digital Transmission System

Limits used:
47CFR15 Section 15.247

Measurement procedure used is ANSI C63.4-2003.

Application for Certification
prepared by:
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TABLE OF CONTENTS

1.	GENERAL INFORMATION -----	5
1.1	Administrative Information	5
1.2	List of Accreditations	7
1.3	Product Description	8
1.4	Test Methodology	8
1.5	Test Facility	8
1.6	Measurement Uncertainty	8
2.	SYSTEM TEST CONFIGURATION -----	9
2.1	Justification	9
2.2	EUT Exercise Software	9
2.3	Special Accessories	9
2.4	Equipment Modifications	9
2.5	Configuration of Tested System	10
3.	TEST SETUP PHOTOS -----	11
4.	CONDUCTED EMISSION DATA -----	12
4.1	Test Specification	12
4.2	Test Procedure	12
4.3	Measured Data	12
4.4	Test Instrumentation Used, Conducted Measurement	17
5.	6DB MINIMUM BANDWIDTH -----	18
5.1	Test Specification	18
5.2	Test procedure	18
5.3	Test Results	20
5.4	Test Equipment Used	21
6.	RADIATED POWER OUTPUT -----	22
6.1	Test Specification	22
6.2	Test procedure	22
6.3	Results Calculation	24
6.4	Test Equipment Used	26
7.	BAND EDGE -----	27
7.1	Test procedure	27
7.2	Results table	30
7.3	Test Equipment Used	31
8.	RADIATED EMISSION, 9 KHZ – 30 MHZ -----	32
8.1	Test Specification	32
8.2	Test Procedure	32
8.3	Measured Data	32
8.4	Test Instrumentation Used, Radiated Measurements	33
8.5	Field Strength Calculation	34
9.	RADIATED EMISSION 30 MHZ – 25000 MHZ -----	35
9.1	Test Specification	35
9.2	Test Procedure	35
9.3	Test Data	36
9.4	Test Instrumentation Used, Radiated Measurements	39
9.5	Field Strength Calculation 30 – 1000 MHz	40

10.	RADIATED POWER SPECTRAL DENSITY-----	41
10.1	Test procedure	41
10.2	Results table.....	43
10.3	Test Equipment Used.....	45
11.	ANTENNA GAIN/INFORMATION -----	46
12.	R.F EXPOSURE/SAFETY -----	47
1.	APPENDIX A - COMPARISON INDUSTRY CANADA REQUIREMENTS WITH FCC --	48
2.	APPENDIX B - CORRECTION FACTORS-----	49
2.1	Correction factors for CABLE	49
2.2	Correction factors for CABLE	50
2.3	Correction factors for CABLE	51
2.4	Correction factors for CABLE	52
12.6	Correction factors for LOG PERIODIC ANTENNA	53
2.5	Correction factors for LOG PERIODIC ANTENNA	54
2.6	Correction factors for BICONICAL ANTENNA	55
2.7	Correction factors for BICONICAL ANTENNA	56
2.8	Correction factors for Double-Ridged Waveguide Horn.....	57
2.9	Correction factors for Horn Antenna.....	58
2.10	Correction factors for Horn Antenna.....	59
2.11	Correction factors for ACTIVE LOOP ANTENNA	60

1. General Information

1.1 Administrative Information

Manufacturer:	Fourier Systems Ltd.
Manufacturer's Address:	9611 West 165 th St., Suite 11b Orland Park IL 60467 USA Tel: +708-364-9500 Fax: +708-364-9555
Manufacturer's Representative:	Haim Bila
Equipment Under Test (E.U.T):	DataNet RH/Temp Logger
Equipment Model No.:	DNL920-PA, DNL910-PA (See customer's declaration on following page).
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	07.02.10
Start of Test:	07.02.10
End of Test:	17.02.10
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 15 Sub-part C



fourier

06/04/10

DECLARATION

I HEREBY DECLARE THAT DataNet 920PA IS A FULL CONFIGURATION MODEL.

OTHER MODELS WHICH INCLUDE

DIFFER FROM THE (Data Net 910-PA) ONLY BY SOFTWARE AND/OR EXTRACTED COMPONENTS/ASSEMBLIES.

Please relate to them all (from an EMC point of view) as the same product.

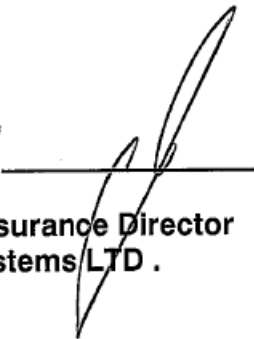
Thank you,

Signature:

Haim Bila,

Quality Assurance Director

Fourier systems LTD .



1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025B-1.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

The DataNet is a 16-bit data logging system with data transmission from units to the central computer utilizing the ZigBee wireless telemetry protocol. ZigBee wireless protocol transmits on a 2.4 GHz license free frequency RF band. Each DataNet unit also serves as a transmission repeater to neighboring units, forming a reliable mesh network of up to 65,000 nodes.

The DNL910-PA and 920-PA loggers with integrated power amplifier for extended range have 4 inputs for direct measurement and recording of PT-100, thermocouple (J, K, T), voltage, current, frequency, pulse and dry contact. The loggers can run from battery or from AC power.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing September 03, 2009). I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Conducted Emission

The uncertainty for this test is ± 2 dB.

Radiated Emission

The Open Site complies with the ± 4 dB Normalized Site Attenuation requirements of ANSI C63.4-2003. In accordance with Paragraph 5.4.6.1 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

2. System Test Configuration

2.1 Justification

For the purposes of the system test the DataNet system was configured in a typical manner, as a customer normally would use it.

The E.U.T. is a wall mounted device.

2.2 EUT Exercise Software

The DataNet hardware runs via the DataNet PC Software.

The software is launched by the user on their PC and once open it detects the DNR900 Receiver and displays the units on the network. Icons represent each of the network units and the user can display the transmission paths between the units.

The software is mainly used to configure the loggers and download and analyze the data. Other features include logger calibration, firmware updates, and alarm notifications.

2.3 Special Accessories

An auxiliary control box, Ember Insight Adapter was used to select the operation channels. After the channel is selected, the control box is disconnected.

2.4 Equipment Modifications

No modifications were needed in order to achieve compliance

2.5 Configuration of Tested System

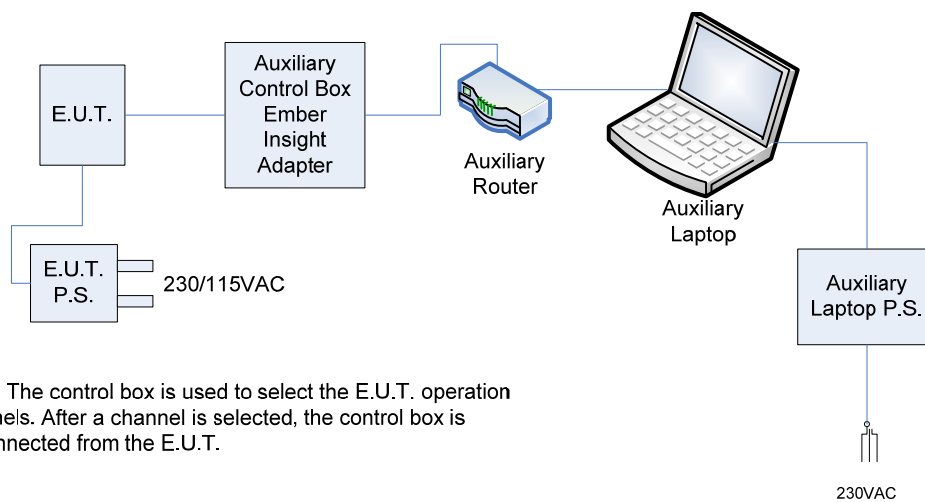


Figure 1. Configuration of Tested System

3. Test Setup photos



Figure 2. Conducted Emission Tested Setup



Figure 3. Radiated Emission Test Setup

4. Conducted Emission Data

4.1 Test Specification

F.C.C., Part 15, Subpart C

4.2 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 3. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz via a 50 Ohm / 50 μ Hn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

4.3 Measured Data

JUDGEMENT: Passed by 28.8 dB

The margin between the emission levels and the specification limit is, in the worst case, 31.3 dB for the phase line at 0.474 MHz and 28.8 dB at 0.480 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart C specification requirements.

The details of the highest emissions are given in *Figure 4* to *Figure 7*.

TEST PERSONNEL:

Tester Signature: Chan Ever

Date: 13/04/2010

Typed/Printed Name: E. Ever

Conducted Emission

E.U.T Description DataNet RH/Temp Logger
Type DNL920-PA
Serial Number: Not Designated

Specification: F.C.C., Part 15, Subpart C
Lead: Phase
Detectors: Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.162503	31.6	24.9	-40.5	-6.9	-62.3	0.4
2	0.219702	29.3	22.4	-40.5	-1.3	-54.2	0.4
3	0.457438	33.2	25.3	-31.5	-7.2	-54.0	0.4
4	0.474336	32.7	25.2	-31.3	-7.0	-53.5	0.4
5	1.026581	12.9	3.8	-52.2	-9.5	-55.5	0.4
6	28.827723	27.0	23.8	-36.2	16.9	-33.1	1.2


Figure 4. Detectors: Peak, Quasi-peak, AVERAGE .

Note: QP Delta/Av Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description DataNet RH/Temp Logger
Type DNL920-PA
Serial Number: Not Designated

Specification: F.C.C., Part 15, Subpart C
Lead: Phase
Detectors: Peak, Quasi-peak, Average

 15:22:27 FEB 07, 2010

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 430 kHz
1.05 dB μ V

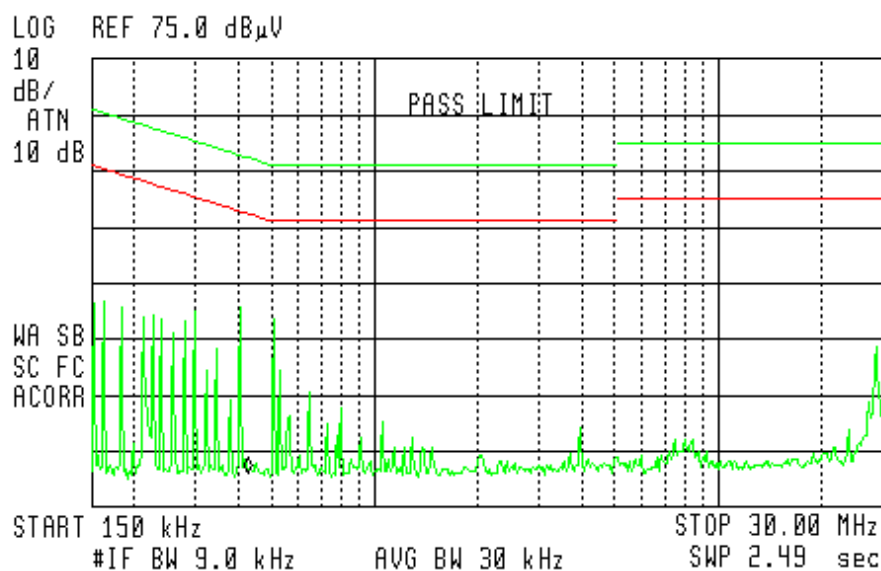


Figure 5. Detectors: Peak, Quasi-peak, Average

Conducted Emission

E.U.T Description DataNet RH/Temp Logger
Type DNL920-PA
Serial Number: Not Designated

Specification: F.C.C., Part 15, Subpart C
Lead: Neutral
Detectors: Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.278665	34.2	25.5	-35.4	-7.4	-58.3	0.4
2	0.296447	33.5	24.6	-35.8	-8.7	-59.1	0.4
3	0.480120	36.4	27.5	-28.8	-6.4	-52.8	0.4
4	0.636333	19.7	10.7	-45.3	-9.2	-55.2	0.4
5	1.325500	11.6	2.3	-53.7	-9.3	-55.3	0.4
6	28.789648	29.2	24.1	-35.9	20.6	-29.4	1.2


Figure 6. Detectors: Peak, Quasi-peak, AVERAGE

Note: QP Delta/Av Delta refer to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description DataNet RH/Temp Logger
Type DNL920-PA
Serial Number: Not Designated

Specification: F.C.C., Part 15, Subpart C
Lead: Neutral
Detectors: Peak, Quasi-peak, Average

 15:32:41 FEB 07, 2010

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 28.74 MHz
27.95 dBμV

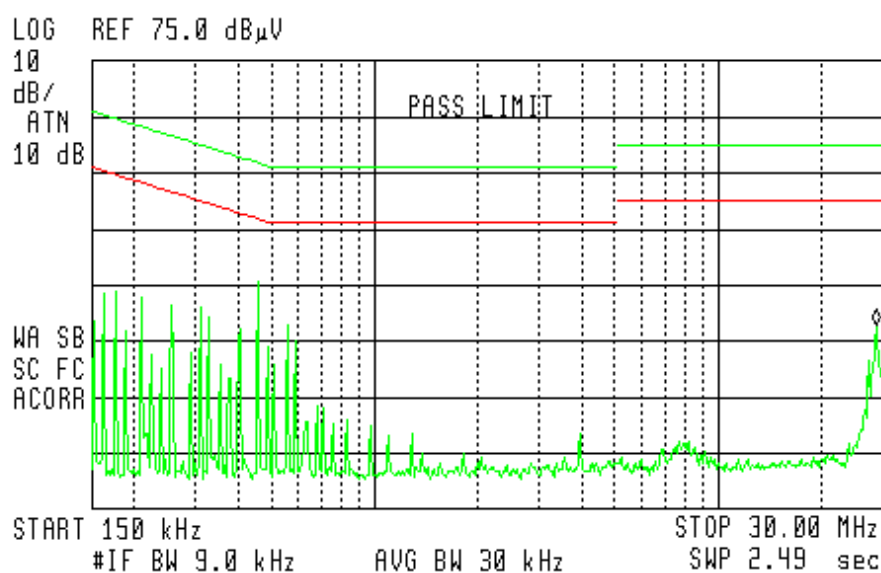


Figure 7 Conducted Emission: NEUTRAL
Detectors: Peak, Quasi-peak, Average

4.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
LISN	Fischer	FCC-LISN-2A	127	March 3, 2009	1 Year
LISN	Fischer	FCC-LISN-2A	128	March 3, 2009	1 Year
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 Year
RF Filter Section	HP	85420E	3705A00248	November 10, 2009	1 Year
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

5. 6dB Minimum Bandwidth

5.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(a)(2)

5.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters. The transmitter unit operated with normal modulation. The EMI receiver was set to 100 kHz resolution BW. The spectrum bandwidth of the transmitter unit was measured and recorded. The test was performed to measure the transmitter occupied bandwidth. The EUT was set up as shown in Figure 3, and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on modulation envelope. The E.U.T. was tested in the following channels and frequencies: channel 12, 2410 MHz; channel 18, 2440 MHz ; and channel 25, 2475 MHz.

12:52:26 FEB 17, 2010

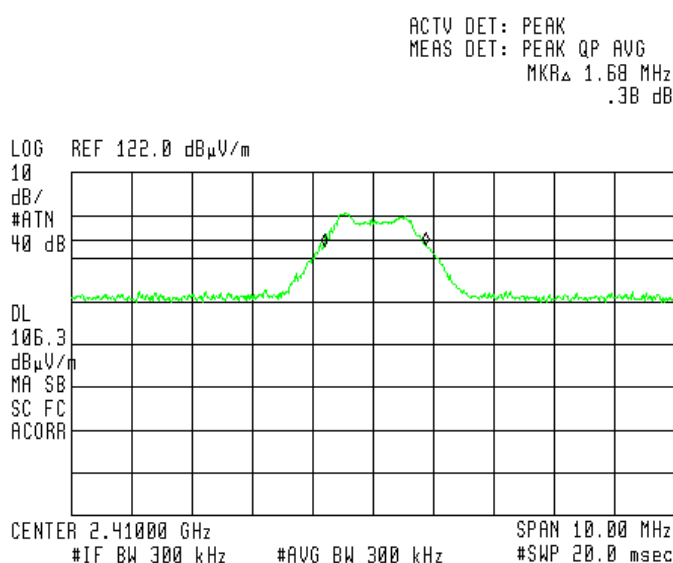


Figure 8. 2410 MHz

12:49:36 FEB 17, 2010

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 1.68 MHz
.57 dB

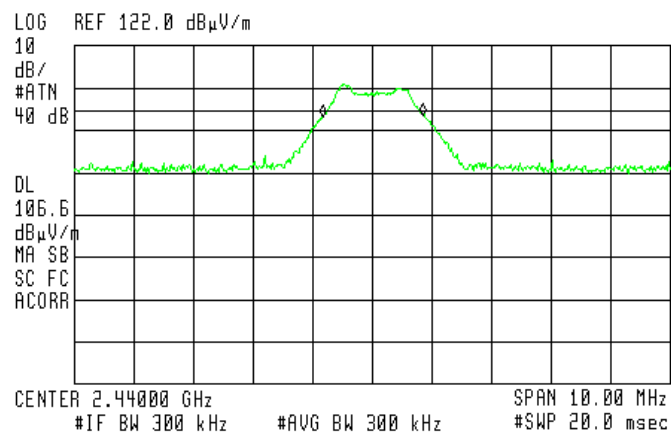


Figure 9. 2440 MHz

12:45:48 FEB 17, 2010

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 1.70 MHz
.32 dB

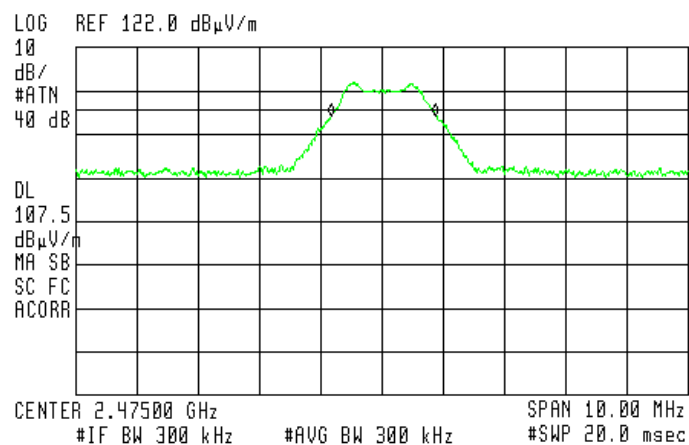


Figure 10. 2745 MHz

5.3 Test Results

E.U.T Description: DataNet RH/Temp Logger

Model: DNL920-PA

Serial Number: Not Designated

Operation Frequency (MHz)	Bandwidth Reading (MHz)	Specification (MHz)
2410	1.68	>0.5
2440	1.68	>0.5
2745	1.70	>0.5

Figure 11 Test Results

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: E. Ever

Date: 13/04/2010

Typed/Printed Name: E. Ever

5.4 Test Equipment Used.

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 29, 2009	2 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

Figure 12 Test Equipment Used

6. Radiated Power Output

6.1 Test Specification

F.C.C. Part 15, Subpart C: 15.247(b)

6.2 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

The E.U.T. was tested in three operating channels and frequencies (12 (2.410 GHz); 18 (2.440 GHz); 25 (2.475 GHz)).

Radiated output power levels were measured at selected operation frequencies and the results were converted to power level according to the formula as shown below:

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} [W]$$

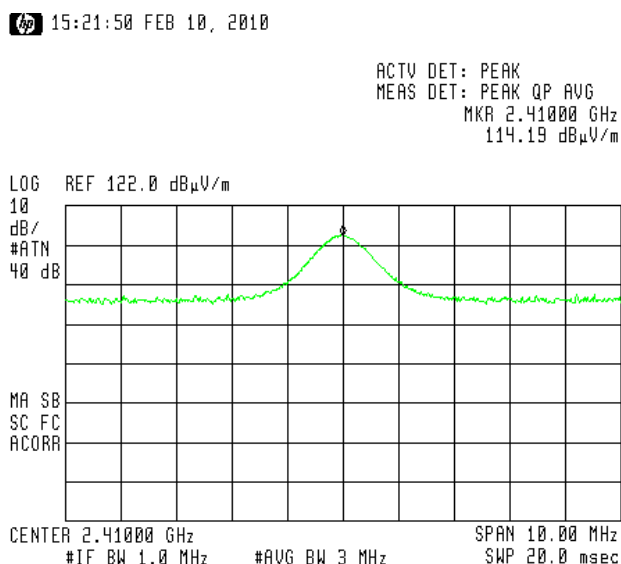


Figure 13 2410 MHz (Horizontal)

15:43:06 FEB 10, 2010

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.43995 GHz
115.21 dB μ V/m

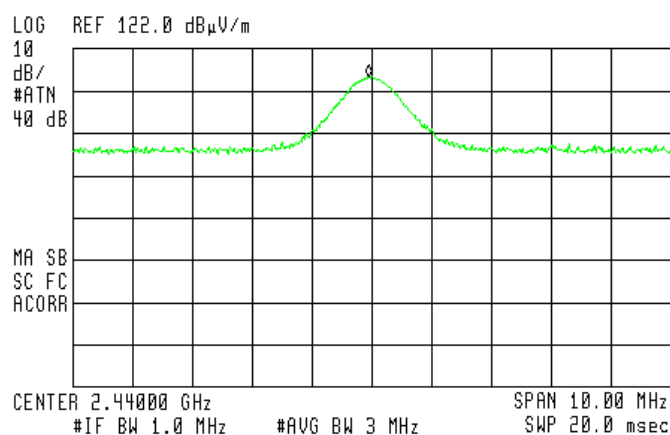


Figure 14 2440 MHz (Vertical)

16:00:17 FEB 10, 2010

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.47498 GHz
117.70 dB μ V/m

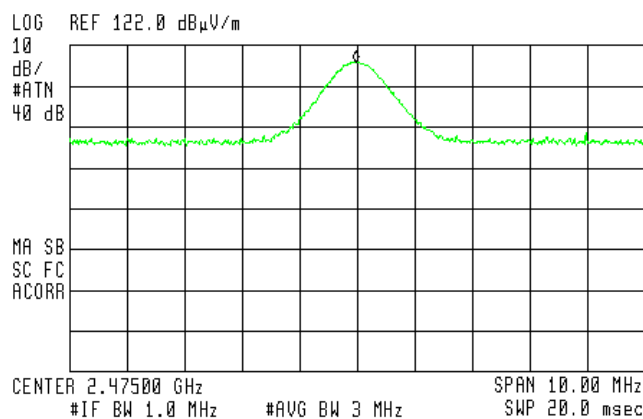


Figure 15 2475 MHz (Horizontal)

6.3 Results Calculation

E.U.T. Description: DataNet RH/Temp Logger

Model No.: DNL920-PA

Serial Number: Not Designated

Specification: F.C.C. Part 15, Subpart C

The following calculations were used to determine maximum radiated power output.

2410 MHz

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} [\text{W}]$$

$$E(V / m) = 10^{-6} \times 10^{\left(\frac{114.19}{20}\right)} = 0.51$$

$$P = \frac{(0.61 \times 3)^2}{(30 \times 1)} = 78.7 \text{ mW}$$

2445 MHz

$$E(V / m) = 10^{-6} \times 10^{\left(\frac{115.21}{20}\right)} = 0.58$$

$$P = \frac{(0.38 \times 3)^2}{(30 \times 1)} = 99.6 \text{ mW}$$

2445 MHz

$$E(V / m) = 10^{-6} \times 10^{\left(\frac{117.7}{20}\right)} = 0.77$$

$$P = \frac{(0.49 \times 3)^2}{(30 \times 1)} = 177 \text{ mW}$$

Frequency	E	E	Antenna Gain	Antenna Distance	Calculated Results	Limit	Margi n
(MHz)	(db μ V/m)	(V/m)	(dBi)	(m)	(mW)	(W)	(mW)
2410.00	114.19	0.51	1	3	78.7	1.0	-921.3
2445.00	115.21	0.58	1	3	99.6	1.0	-900.4
2475.00	117.70	0.77	1	3	177.0	1.0	-823.0

Figure 16 Test Results

JUDGEMENT: Passed by 823.0 mW

TEST PERSONNEL:

Tester Signature: *E. Ever*

Date: 13/04/2010

Typed/Printed Name: E. Ever

6.4 Test Equipment Used.

Radiated Maximum Power Output

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A
Antenna-Log Periodic	A.H.System	SAS-200/511	253	January 29, 2009	2 years

Figure 17 Test Equipment Used

7. Band Edge

[In Accordance with section 15.247(d)]

7.1 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The EMI receiver was adjusted to the transmission channel at the maximum radiated level. The display line was set to 20 dBc and the EMI receiver was set to the band edge frequencies.

Maximum power level below 2400 MHz and above 2483.5 MHz was measured relative to power level at 2410 MHz, and 2475 MHz correspondingly.

The E.U.T. was tested in 2 operating channels and frequencies (12 (2.410 GHz); 25 (2.475 GHz)).

The E.U.T. was tested at 2410 and 2475 MHz.

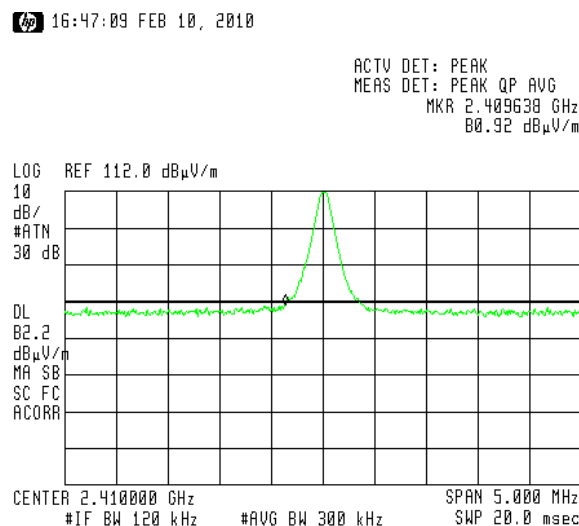


Figure 18 — 2410 MHz

16:46:19 FEB 10, 2010

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.410363 GHz
81.25 dB μ V/m

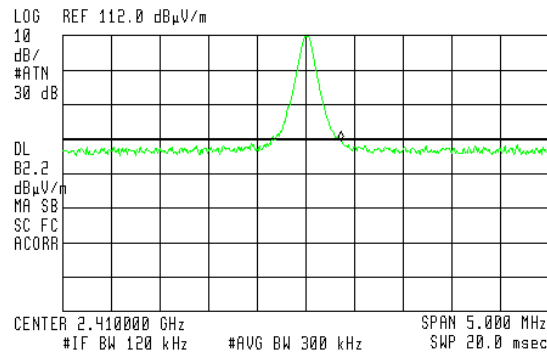


Figure 19 — 2410 MHz

16:41:22 FEB 10, 2010

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.474600 GHz
80.76 dB μ V/m

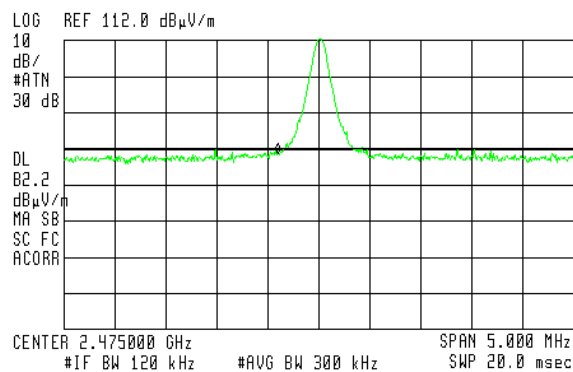


Figure 20 — 2475 MHz

16:40:21 FEB 10, 2010

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 2.475350 GHz
 80.80 dB μ V/m

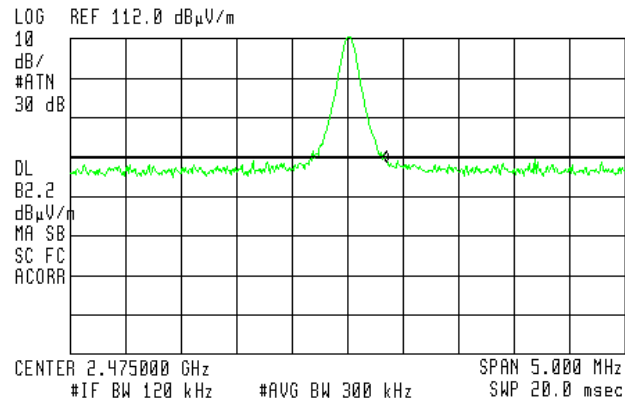


Figure 21 — 2475 MHz

7.2 Results table

E.U.T. Description: DataNet RH/Temp Logger
 Model No.: DNL920-PA
 Serial Number: Not Designated
 Specification: F.C.C. Part 15, Subpart C (15.247 (d))

Operation Frequency (MHz)	Band Edge Frequency (MHz)	Spectrum Level (dBuV/m)	Specification (dBuV/m)	Margin (dB)
2410	2409.638	80.9	95.8	-14.9
2410	2410.363	81.3	95.8	-14.5
2475	2474.600	80.8	93.9	-13.1
2475	2475.350	80.8	93.9	-13.1

Figure 22 Band Edge

JUDGEMENT: Passed by 13.1 dB

TEST PERSONNEL:

Tester Signature: *Chan Ever*

Date: 13/04/2010

Typed/Printed Name: E. Ever

7.3 Test Equipment Used.

Band edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A
Antenna-Log Periodic	A.H.System	SAS-200/511	253	January 29, 2009	2 years

Figure 23 Test Equipment Used

8. Radiated Emission, 9 kHz – 30 MHz

8.1 Test Specification

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

8.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-30 MHz was scanned.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 3 meters.

The E.U.T. was tested in three operating channels and frequencies (12 (2.410 GHz); 18 (2.440 GHz); 25 (2.475 GHz)).

8.3 Measured Data

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 209 specification.

The results for all three channels were the same.

No signals were detected in the frequency range of 9 kHz – 30 MHz.

TEST PERSONNEL:

Tester Signature: E. Ever

Date: 13/04/2010

Typed/Printed Name: E. Ever

8.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2009	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

8.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS:	Field Strength [dB μ V/m]
RA:	Receiver Amplitude [dB μ V]
AF:	Receiving Antenna Correction Factor [dB/m]
CF:	Cable Attenuation Factor [dB]

Example: $FS = 30.7 \text{ dB}\mu\text{V (RA)} + 14.0 \text{ dB (AF)} + 0.9 \text{ dB (CF)} = 45.6 \text{ dB}\mu\text{V}$

No external pre-amplifiers are used.

9. Radiated Emission 30 MHz – 25000 MHz

9.1 Test Specification

30 MHz-25000 MHz, F.C.C., Part 15, Subpart C

9.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground..

The frequency range 30 MHz-25000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used.

In the frequency range 2.9-25.0 GHz, a spectrum analyzer including a low noise amplifier was used. During average measurements, the IF bandwidth was 1 MHz and the video bandwidth was 100Hz. During peak measurements, the IF bandwidth was 1 MHz and the video bandwidth was 3 MHz.

The test distance was 3 meters.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The E.U.T. was tested in three operating channels and frequencies (12 (2.410 GHz); 18 (2.440 GHz; 25 (2.475 GHz)).

9.3 Test Data

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification.

The results for all three operation channels were the same in the frequency range of 30 MHz – 1.0 GHz.

The signals in the band 30 MHz – 1.0 GHz were below the spectrum analyzer noise level, at least 20 dB below the specification limit.

For the operation channel 1 (2.410 GHz), the margin between the emission level and the specification limit is -25.7 dB in the worst case at the frequency of 4820.00 MHz, horizontal polarization.

For the operation channel 8 (2.440 GHz), the margin between the emission level and the specification limit is -22.5 dB in the worst case at the frequency of 4880.00 MHz, horizontal polarization.

For the operation channel 14 (2.475 GHz), the margin between the emission level and the specification limit is -23.7 dB in the worst case at the frequency of 4950.00 MHz, horizontal and vertical polarizations.

TEST PERSONNEL:

Tester Signature: E. Ever

Date: 13/04/2010

Typed/Printed Name: E. Ever

Radiated Emission

E.U.T Description DataNet RH/Temp Logger
Type DNL920-PA
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters Detector: Peak

Operation Frequency (MHz)	Freq. (MHz)	Polarity (H/V)	Peak Reading (dB μ V/m)	Peak. Specification (dB μ V/m)	Peak. Margin (dB)
2410.00	4820.00	H	45.3*	74.0	-28.7
2410.00	4820.00	V	48.3*	74.0	-25.7
2440.00	4880.00	H	51.5*	74.0	-22.5
2440.00	4880.00	V	50.2*	74.0	-23.8
2475.00	4950.00	H	48.9*	74.0	-25.1
2475.00	4950.00	V	50.3*	74.0	-23.7

**Figure 24. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.
Detector: Peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Reading” includes correction factor.

* “Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

Radiated Emission Above 1 GHz

E.U.T Description DataNet RH/Temp Logger
Type DNL920-PA
Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters Detector: Average
Operation Frequency: MHz

Operation Frequency	Freq.	Polarity	Average Reading	Average Specification	Average Margin
(MHz)	(MHz)	(H/V)	(dB μ V/m)	(dB μ V/m)	(dB)
2410.00	4820.00	H	43.9*	54.0	-10.1
2410.00	4820.00	V	44.6*	54.0	-9.4
2440.00	4880.00	H	47.5*	54.0	-6.5
2440.00	4880.00	V	49.6*	54.0	-4.4
2475.00	4950.00	H	46.2*	54.0	-7.8
2475.00	4950.00	V	47.3*	54.0	-6.7

**Figure 25. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.
Detector: Average**

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Average Reading” includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

9.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 Year
RF Filter Section	HP	85420E	3705A00248	November 10, 2009	1 Year
Antenna Biconical	ARA	BCD 235/B	1041	March 25, 2009	1 Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 6, 2009	1 Year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 29, 2009	2 Years
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 16, 2008	2 Years
Horn Antenna	ARA	SWH-28	1008	December 23, 2008	2 Years
Horn Antenna	Narda	V637	0410	December 23, 2008	2 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	January 13, 2010	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 13, 2010	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	March 17, 2009	1 Year
Spectrum Analyzer	HP	8546E	3442A00275	January 11, 2010	1 Year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

9.5 Field Strength Calculation 30 – 1000 MHz

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$[\text{dB}\mu\text{V/m}] \text{ FS} = \text{RA} + \text{AF} + \text{CF}$$

FS:	Field Strength [dB $\mu\text{V/m}$]
RA:	Receiver Amplitude [dB μV]
AF:	Receiving Antenna Correction Factor [dB/m]
CF:	Cable Attenuation Factor [dB]

Example: $\text{FS} = 30.7 \text{ dB}\mu\text{V (RA)} + 14.0 \text{ dB (AF)} + 0.9 \text{ dB (CF)} = 45.6 \text{ dB}\mu\text{V}$

No external pre-amplifiers are used.

10. Radiated Power Spectral Density

[In accordance with section 15.247(d)]

10.1 Test procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters.

The transmitter unit operated with normal modulation. The EMI receiver was set to 1 MHz resolution BW. The EUT was set up as shown in Figure 3, and its proper operation was checked.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

The E.U.T. was tested in three operating channels and frequencies (12 (2.410 GHz); 18 (2.440 GHz); 25 (2.475 GHz)).

Then the EMI receiver was set to 3 kHz resolution BW, span of 300.0 kHz, and sweep time of 100 seconds. The spectrum peaks were located at each of the 3 operating frequencies.

Radiated peak output power levels were converted to power level according to the formula as shown below:

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} [\text{W}]$$

12:23:58 FEB 17, 2010

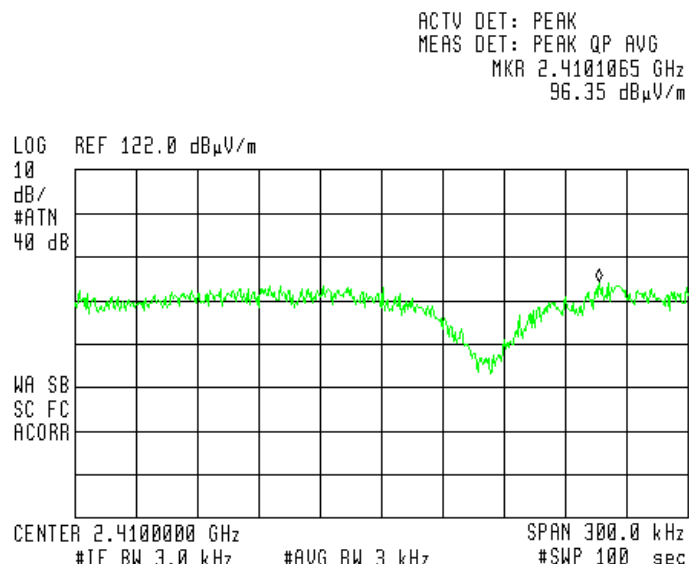


Figure 26 — 2410 MHz

12:17:21 FEB 17, 2010

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.4399485 GHz
98.14 dB μ V/m

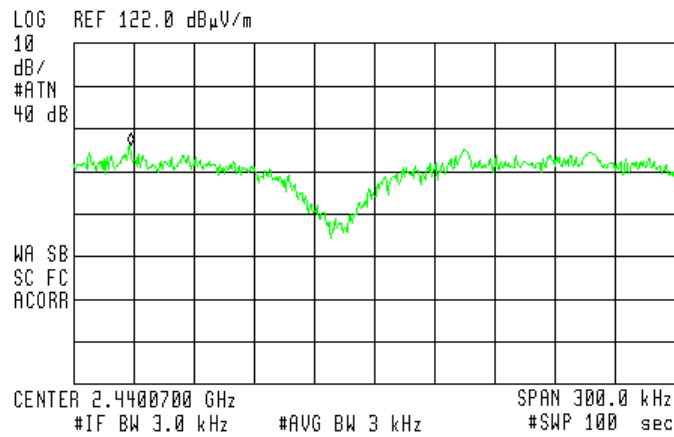


Figure 27 — 2440 MHz

12:33:41 FEB 17, 2010

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.4749505 GHz
98.59 dB μ V/m

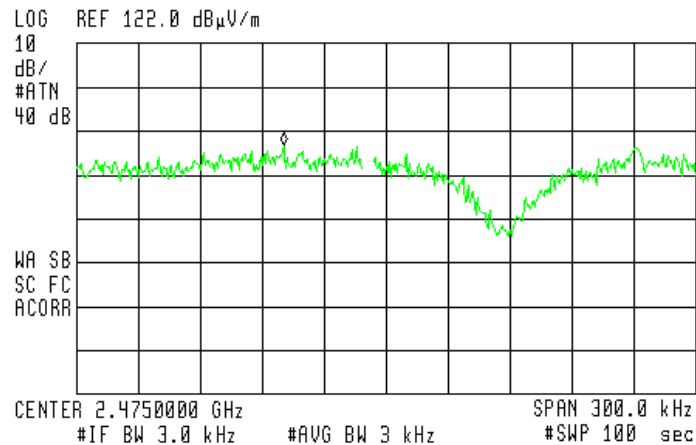


Figure 28 — 2475 MHz

10.2 Results table

E.U.T. Description: DataNet RH/Temp Logger

Model No.: DNL920-PA

Serial Number: Not Designated

Specification: F.C.C. Part 15, Subpart C (15.247(d))

Operation Frequency (MHz)	Spectral Density Result* (dBm)	Specification (dBm)	Margin (dB)
2410	1.12	8.0	-6.8
2440	2.91	8.0	-5.09
2475	3.36	8.0	-4.64

Figure 29 Test Results

* Spectral Density results were calculated as follows:

For 2410 MHz

$$P = \frac{(0.07 \times 3)^2}{(30 \times 1)} = 1.29mW$$

For 2440 MHz

$$P = \frac{(0.08 \times 3)^2}{(30 \times 1)} = 1.95mW$$

For 2475 MHz

$$P = \frac{(0.09 \times 3)^2}{(30 \times 1)} = 2.16mW$$

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: E. Ever

Date: 13/04/2010

Typed/Printed Name: E. Ever

10.3 Test Equipment Used.

Transmitted Power Density

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 29, 2009	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

Figure 30 Test Equipment Used

11. Antenna Gain/Information

The antenna gain is 5 dBi.

12. R.F Exposure/Safety

Typical use of the E.U.T. is a wall mounted data monitoring unit. The typical placement of the E.U.T. is wall or ceiling mounted. The typical distance between the E.U.T. and the user in the worst case application, is >20 cm.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1307(b)(1) Requirements

(a) FCC limits at 2437 MHz is: $1 \frac{mW}{cm^2}$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

(b) The power density produced by the E.U.T. is

$$S = \frac{P_t G_t}{4\pi R^2}$$

P_t- Transmitted Power 177 mw (Peak)

G_T- Antenna Gain, 5 dBi = 3.16

R- Distance from Transmitter using 20 cm worst case

(c) The peak power density is :

$$S_p = \frac{117 \times 3.16}{4\pi(20)^2} = 7.4 \times 10^{-2} \frac{mW}{cm^2}$$

(f) This is below the FCC limit.

1. **Appendix A - Comparison Industry Canada Requirements With FCC**

Fourier T2 Tag

M/N : DataNet RH/Temp Logger

FCC ID: XGO-DNL9XXPA IC: 8833A-DNL920PA

Test	FCC	IC
<input type="checkbox"/> Max power / Peak power	15.247(b)(3)	RSS 210 Issue 7 A8.4(4)
<input type="checkbox"/> 6dB BW	15.247(a)2	RSS 210 Issue 7 A8.2a
<input type="checkbox"/> Power density	15.247(e)	RSS 210 Issue 7 A8.2b
<input type="checkbox"/> Spurious radiated emission in the restricted band	15.205(c)	RSS 210 Issue 7 2.7(Table2)
<input type="checkbox"/> Band edge spectrum	15.247(d)	RSS 210 Issue 7 A8.5
<input type="checkbox"/> RF Exposure Limits	1.1307(b)(1)	RSS 102 4.4

2. APPENDIX B - CORRECTION FACTORS

2.1 Correction factors for CABLE

from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
90.0	1.6		
100.0	1.7		
150.0	2.0		
200.0	2.3		
250.0	2.7		
300.0	3.1		
350.0	3.4		
400.0	3.7		
450.0	4.0		
500.0	4.3		
600.0	4.7		
700.0	5.3		
800.0	5.9		
900.0	6.3		
1000.0	6.7		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 27 meters.
3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".

2.2 Correction factors for CABLE

from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

1. The cable type is RG-8.
2. The overall length of the cable is 10 meters.

2.3 Correction factors for CABLE

from spectrum analyzer
to test antenna above 2.9 GHz

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

NOTES:

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.
2. The cable is used for measurements above 2.9 GHz.
3. The overall length of the cable is 10 meters.

2.4 Correction factors for CABLE

from EMI receiver
to test antenna
at 10 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	9.8
20.0	0.8	1400.0	10.0
30.0	0.9	1600.0	11.3
40.0	1.2	1800.0	12.2
50.0	1.4	2000.0	13.1
60.0	1.6	2300.0	14.5
70.0	1.8	2600.0	15.9
80.0	1.9	2900.0	16.4
90.0	2.0		
100.0	2.1		
150.0	2.6		
200.0	3.2		
250.0	3.8		
300.0	4.2		
350.0	4.6		
400.0	5.1		
450.0	5.3		
500.0	5.6		
600.0	6.3		
700.0	7.0		
800.0	7.6		
900.0	8.0		
1000.0	8.7		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 34 meters.
3. The above data is located in file 34M10MO.CBL on the disk marked "Radiated Emissions Tests EMI Receiver".

12.6 Correction factors for LOG PERIODIC ANTENNA

**Type LPD 2010/A
at 3 and 10 meter ranges.**

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

NOTES:

- 1. Antenna serial number is 1038.*
- 2. The above lists are located in file number 38M30.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.*
- 3. The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".*

2.5 Correction factors for LOG PERIODIC ANTENNA
Type SAS-200/511
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
1.0	24.9
1.5	27.8
2.0	29.9
2.5	31.2
3.0	32.8
3.5	33.6
4.0	34.3
4.5	35.2
5.0	36.2
5.5	36.7
6.0	37.2
6.5	38.1

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
7.0	38.6
7.5	39.2
8.0	39.9
8.5	40.4
9.0	40.8
9.5	41.1
10.0	41.7
10.5	42.4
11.0	42.5
11.5	43.1
12.0	43.4
12.5	44.4
13.0	44.6

NOTES:

1. Antenna serial number is 253.
2. The above lists are located in file number SAS3M0.ANT for a 3 meter range.
3. The files mentioned above are located on the disk marked "Antenna Factors".

2.6 Correction factors for **BICONICAL ANTENNA**

**Type BCD-235/B,
at 3 meter range**

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.
2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

2.7 Correction factors for **BICONICAL ANTENNA**

**Type BCD-235/B,
10 meter range**

FREQUENCY (MHz)	AFE (dB/m)
30.0	12.1
40.0	10.6
50.0	10.6
60.0	8.9
70.0	8.5
80.0	9.6
90.0	9.4
100.0	9.6
110.0	10.3
120.0	10.7
130.0	12.6
140.0	12.7
150.0	12.7
160.0	13.8
170.0	13.7
180.0	14.9
190.0	13.4
200.0	13.1
210.0	14.0
220.0	14.5
230.0	15.8
240.0	16.0
250.0	16.6
260.0	16.7
270.0	18.3
280.0	18.5
290.0	19.3
300.0	20.9

NOTES:

1. Antenna serial number is 1041.
2. The above list is located in file 41BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

2.8 Correction factors for Double-Ridged Waveguide Horn

**Model: 3115, S/N 29845
at 3 meter range.**

FREQUENCY	ANTENNA	ANTENN	FREQUENCY	ANTENNA	ANTENNA
(GHz)	FACTOR	A Gain	(GHz)	FACTOR	Gain
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			

2.9 Correction factors for

Horn Antenna
Model: SWH-28
at 1 meter range.

FREQUENCY (GHz)	APE (dB /m)	Gain (dBi)
18.0	40.3	16.1
19.0	40.3	16.3
20.0	40.3	16.1
21.0	40.3	16.3
22.0	40.4	16.8
23.0	40.5	16.4
24.0	40.5	16.6
25.0	40.5	16.7
26.0	40.6	16.4

2.10 Correction factors for

Horn Antenna Model: V637

FREQUENCY (GHz)	AFE (dB /m)	Gain (dB1)
26.0	43.6	14.9
27.0	43.7	15.1
28.0	43.8	15.3
29.0	43.9	15.5
30.0	43.9	15.8
31.0	44.0	16.0
32.0	44.1	16.2
33.0	44.1	16.4
34.0	44.1	16.7
35.0	44.2	16.9
36.0	44.2	17.1
37.0	44.2	17.4
38.0	44.2	17.6
39.0	44.2	17.8
40.0	44.2	18.0

2.11 Correction factors for ACTIVE LOOP ANTENNA

Model 6502

S/N 9506-2950

FREQUENCY	Magnetic Antenna Factor	Electric Antenna Factor
(MHz)	(dB)	(dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2