dBi Corporation

FCC Certification Test Report
BAPI Temperature/Humidity Sensor
Report Number 06dBi004a
(this test report replaces test report 06dBi004)

Laboratory
Certificate Number 1985-01

ADMINISTRATIVE INFORMATION

Historical record:
Because dBi Corporation is a testing entity, and not a manufacturer, this original test report of the Temperature/Humidity Sensor is being transmitted to the manufacturer, Building Automation Products, Inc. (BAPI). dBi will keep a copy for its historical records and to satisfy A2LA-Audit requirements. We strongly recommend archiving the unit that we tested to facilitate answering future inquiries regarding this product.

Retention of records:
The FCC requires the records for a Class A or Class B product to be retained by the responsible party for at least two years after the manufacture of said product has been permanently discontinued. These records should include the original certification or verification product report, quality audit data, and the test procedures used.

The European Union requires the Declaration of Conformity (DoC) and all supporting data for a product bearing the CE Mark to be retained, and available for inspection by enforcement authorities, for 10 years after placing the product on the market.

Australia and New Zealand require the Declaration of Conformity, test reports, a description of the product, documentation that clearly identifies the product, and paperwork showing the product's brand name, model number, etc. to be kept for at least five years after the product ceases to be supplied to Australia or New Zealand.

Measurement uncertainties:
The Lexmark Electromagnetic Compatibility Laboratory (EMC Lab) has a documented calculation of the measurement uncertainties associated with tests performed at the Lexmark site.

Ongoing compliance:
This report applies only to the sample tested. The manufacturer has full responsibility for ensuring that the production models of the Temperature/Humidity Sensor comply with the FCC and CE Mark requirements, and continue to comply throughout their manufacturing life. The manufacturer should check all changes to the product that could change its interference profiles.

A2LA approval:
dBi Corporation has been accredited by the American Association for Laboratory Accreditation (A2LA) for Radiated Emissions and Conducted Emissions, Electromagnetic Interference, and Electrostatic Discharge testing. Copies of our Accreditation Certificate and Scope of Accreditation follow.

The Federal Communications Commission (FCC) recognized the Lexmark site as meeting the requirements of section 2.948 of the FCC Rules in a letter dated December 10, 2001. This information is on file with the FCC under Registration No. 949691.

Please note: This report may be copied as needed, as long as it is copied in its entirety.

THE AMERICAN
ASSOCIATION
FOR LABORATORY
ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

DBI CORPORATION
Lexington, KY

for technical competence in the field of

Electrical Testing

The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration Laboratories" and any additional program requirements in the identified field of testing.

Presented this 21st day of September 2004.

President
For the Accreditation Council
Certificate Number 1985-01
Valid to September 30, 2006

For tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999

dBi CORPORATION[1]
216 Hillsboro Avenue
Lexington, KY 40511-2105
John R. Barnes Phone: 859 253 1178

ELECTRICAL (EMC)

Valid To: September 30, 2006 Certificate Number: 1985-01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests:

Test Technology	Test Method(s)
Radiated Emissions	CFR 47, FCC Method Part 15, Class A and B (using ANSIC63.4-2001) AS/NZS 3548-1995, AS/NZS CISPR 22:2002 CISPR 22-2003, 1997, 1993 EN 55022-1994, 1998 VCCI 2002
Conducted Emissions	CFR 47, FCC Method Part 15, Class A and B (using ANSI C63.4-2001) AS/NZS 3548-1995, CISPR 14-1:2000; EN 55014-1:2000; AS/NZS CISPR 22:2002; CISPR 22-2003, 1997, 1993 EN 55022-1994, 1998 VCCI 2002
Harmonics	IEC 61000-3-2:1995, 2001, EN 61000-3-2:1995, 2000
Flicker	IEC 61000-3-3:1994, 2002; EN 61000-3-3:1995
Immunity	
Electrostatic Discharge (ESD)	IEC 61000-4-2:1995 EN 61000-4-2:1995
Radiated Immunity	IEC 61000-4-3:1995, 2002 EN 61000-4-3:1996
Electrical Fast Transient/Burst	IEC 61000-4-4:1995 EN 61000-4-4:1995

(A2LA Cert. No. 1985-01) 09/21/01 Page 1 of 2

5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8373 • Phone: 301-644 3248 • Fax: 301-662 2974

Test Technology	Test Method(s)
Surge Immunity	IEC 61000-4-5:1995 EN 61000-4-5:1995
Conducted Immunity	IEC 61000-4-6:1996 EN 61000-4-6:1996
Magnetic Field Immunity	IEC 61000-4-8:1993, 2001 EN 61000-4-8:1993
Voltage Dips/Interruption Immunity	IEC 61000-4-11:1994, 2001 EN 61000-4-11:1994
ITE Product Family	CISPR 24:1997 EN 55024:1998
Generic Devices for Residential, Commercial, and Light Industrial Use	EN 61000-6-1:2001; EN 61000-6-3:2001; AS/NZS 4251.1-1999
Generic Devices for Industrial Use	EN 61000-6-2:1999, 2001
Electrical Equipment for Measurement, Control, and Laboratory Use	IEC 61326:1997, 2002 EN 61326:1997

On materials and products related to the following:

Information Technology Equipment - Computers, Printers, Peripheral Devices;
Generic Devices for residential, commercial, and light industrial use;
Generic Devices for industrial use;
Electrical equipment for measurement, control and laboratory use

[1] NOTE: Testing is performed using the equipment and facilities at Lexmark International EMC Laboratory (A2LA Accreditation Certificate 0872-01)

(A2LA Cert. No. 1985-01) 09/21/01

Page 2 of 2

ADMINISTRATIVE DATA

Manufacturer:

Building Automation Products, Inc.
750 North Royal Avenue
Gays Mills, WI 54631

Appliance/Product: Temperature/Humidity Sensor
Model/Type Number: BA/BS2-WTHT
FCC ID: T4F16963N16964
Rating: 3.6Vdc (Lithium batteries)

Measurement Equipment used: see attached sheets.
Measurements According to, and Sample Unit Complies with:

FCC 47 CFR Part 15-2005, using ANSI C63.4-2003

Report Prepared By: John R. Barnes KS4GL, PE, NCE, NCT, ESDC Eng, ESDC Tech, PSE, SM IEEE

Testing Performed by:

dBi Corporation
216 Hillsboro Avenue
Lexington, KY 40511-2105, USA

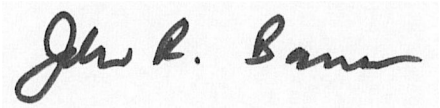
Testing Performed on:

March 22-25, 2006

Testing Performed at:

Lexmark International, Inc.
Development Lab.
Lexington, KY 40550, USA

Suppression Components: see attached sheet.
Reviewed and Approved by: John R. Barnes KS4GL, PE, NCE, NCT, ESDC Eng, ESDC Tech, PSE, SM IEEE



SIGNED_____**DATE**__April 14, 2006__

John R. Barnes, PRESIDENT dBi Corp.

INFORMATION RELATING TO PRODUCT RF INTERFERENCE

Appliance/Product: Temperature/Humidity Sensor
Model/Type Number: BA/BS2-WTHT
FCC ID: T4F16963N16964
Rating: 3.6Vdc (Lithium batteries)

Suppression Components: none

Clock Frequencies: 8MHz and 418MHz

Cables: none

Electronic Printed Circuit Boards:
SM060116

Size of Product: 71mm x 27mm x 115mm high

Weight of Product: 110g

Radiated Emissions 30-4,180 MHz (Internal Battery)

Radiated Emission Standards:

FCC 47 CFR Part 15-2005, using ANSI C63.4-2003; section 15.231(e) limits for 418MHz.

Appliance/Product: Temperature/Humidity Sensor
Model/Type Number: BA/BS2-WTHT
FCC ID: T4F16963N16964
Rating: 3.6Vdc (Lithium batteries)
Serial Number: 60357000

Host and Other Peripherals: None

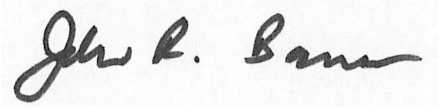
Name of Test: Radiated Interference
Test Procedure: ANSI C63.4-2003
Test Location: 10m and 5m semianechoic chambers
Test Distance: 3m
Test Instrumentation: See attached sheets

Note: Transmitting at 1 second intervals to speed up testing. For measurements under 1,000MHz we used a 20dB attenuator at the antenna to prevent signal compression. At the highest orientation/ azimuth/height based on quasipeak measurements, we measured peak, quasipeak, and average values with 0dB, 10dB, 20dB, and 30dB attenuators. The differences between the 20dB and the 30dB-attenuation values were approximately 10dB, showing that 20dB attenuation was enough. Average and peak measurements below 1,000MHz were made with the receiver in manual mode with a 100ms sample time, watching the display to catch the highest value. Because we could only catch the top two digits, we added 0.99dB to the measured value to be conservative.

Test Results: Tables 1 and 2, and the Transmitted Bandwidth Data show that this unit meets the radiated interference requirements of FCC Part 15 for an intentional radiator licensed to operate at 418MHz under Section 15.231(e).

.

Under Section 15.231(e), the average limit for the fundamental is calculated by linear interpolation from 1500uV/m at 260MHz, to 5000uV/m at 470MHz when measured at 3m. Average limit = ((5000uV/m-1500uV/m)*(418MHz-260MHz)/(470MHz-260MHz))+1500uV/m = 4133uV/m = 20*log(4133) dB(uV/m) = 72.33dB(uV/m). Section 15.35(b) sets the peak limit for the fundamental to 20 dB above the average limit, or 92.33dB(uV/m) at 3m. For spurious emissions, Section 15.231(e) sets the average limit to 20dB below the maximum permitted fundamental level, or 52.33dB(uV/m) at 3m, with the peak limit 20dB higher at 72.33dB(uV/m).



SIGNED_____**DATE** April 13, 2006

John R. Barnes, PRESIDENT dBi Corp.

Radiated Emissions Data 30-4,180MHz (Internal Battery)

Appliance/Product: Temperature/Humidity Sensor
Model/Type Number: BA/BS2-WTHT
FCC ID: T4F16963N16964
Rating: 3.6Vdc (Lithium batteries)
Serial Number: 60357000

TABLE 1 PEAK EMISSIONS

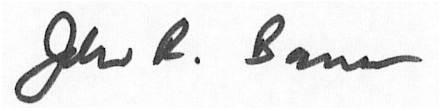
Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)*	Receiver Reading Horiz. (dB(uV)*	Cable Correction Factor dB	Antenna Correction Factor dB(/m)	Radiated Interference Field Strength Vert. dB(uV/m)	Radiated Interference Field Strength Horiz. dB(uV/m)	15.231e Peak Limit dB(uV/m)
418.0	88.614	81.614	-24.960	16.530	80.184	73.184	92.33
836.0	59.485	64.485	-23.111	22.810	59.184	64.184	72.33
1254.1	55.739	51.006	-28.998	24.064	50.805	46.072	72.33
1672.0	53.544	51.420	-27.190	25.485	51.839	49.715	72.33
2090.1	51.007	52.114	-26.226	26.897	51.678	52.785	72.33
2508.0	38.024	38.957	-25.163	28.276	41.137	42.070	72.33
2926.0	41.085	40.056	-24.506	29.656	46.235	45.206	72.33
3344.0	41.970	41.336	-23.440	30.210	48.740	48.106	72.33
3762.0	51.420	46.347	-21.182	30.586	60.824	55.751	72.33
4180.0	46.345	41.459	-21.196	31.340	56.489	51.603	72.33

Sample Calculation: Receiver reading dB(uV) plus cable correction factor (dB) plus antenna correction factor dB(/m) equals Radiated Interference Field Strength dB(uV/m).

* The unit was checked flat, upright, and sideways in both vertical and horizontal polarizations to find the orientation for maximum emissions in quasipeak mode. With or without signal compression, the rank ordering of peak, quasipeak, and average measurements for these orientations/polarizations stays the same even if the measured values may be inaccurate.

Note: Radiated measurements under 1,000MHz were performed at 3 meters in the Lexmark 5m semi-anechoic chamber, and radiated measurements over 1,000MHz were performed at 3m in the 10m semi-anechoic chamber, both located at Lexington, KY.

PROCEDURE: Test Performed Per ANSI 63.4 – 2003.



Signed_____**Date** April 13, 2006
John R. Barnes, PRESIDENT dBi Corporation

Radiated Emissions Data 30-4,180MHz (Internal Battery, continued)

TABLE 2 AVERAGE EMISSIONS

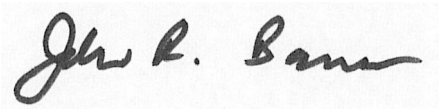
Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)*	Receiver Reading Horiz. (dB(uV)*	Cable Correction Factor dB	Antenna Correction Factor dB(/m)	Radiated Interference Field Strength Vert. dB(uV/m)	Radiated Interference Field Strength Horiz. dB(uV/m)	15.231e Average Limit dB(uV/m)
418.0	67.614	61.614	-24.960	16.530	59.184	53.184	72.33
836.0	43.485	46.485	-23.111	22.810	43.184	46.184	52.33
1254.1	35.943	32.449	-28.998	24.064	31.009	27.515	52.33
1672.0	30.292	29.336	-27.190	25.485	28.587	27.631	52.33
2090.1	31.343	32.478	-26.226	26.897	32.014	33.149	52.33
2508.0	24.439	24.551	-25.163	28.276	27.552	27.664	52.33
2926.0	25.992	25.467	-24.506	29.656	31.142	30.617	52.33
3344.0	25.493	24.929	-23.440	30.210	32.263	31.699	52.33
3762.0	31.435	29.049	-21.182	30.586	40.839	38.453	52.33
4180.0	28.538	25.639	-21.196	31.340	38.682	35.783	52.33

Sample Calculation: Receiver reading dB(uV) plus cable correction factor (dB) plus antenna correction factor dB(/m) equals Radiated Interference Field Strength dB(uV/m).

* The unit was checked flat, upright, and sideways in both vertical and horizontal polarizations to find the orientation for maximum emissions in quasipeak mode. With or without signal compression, the rank ordering of peak, quasipeak, and average measurements for these orientations/polarizations stays the same even if the measured values may be inaccurate.

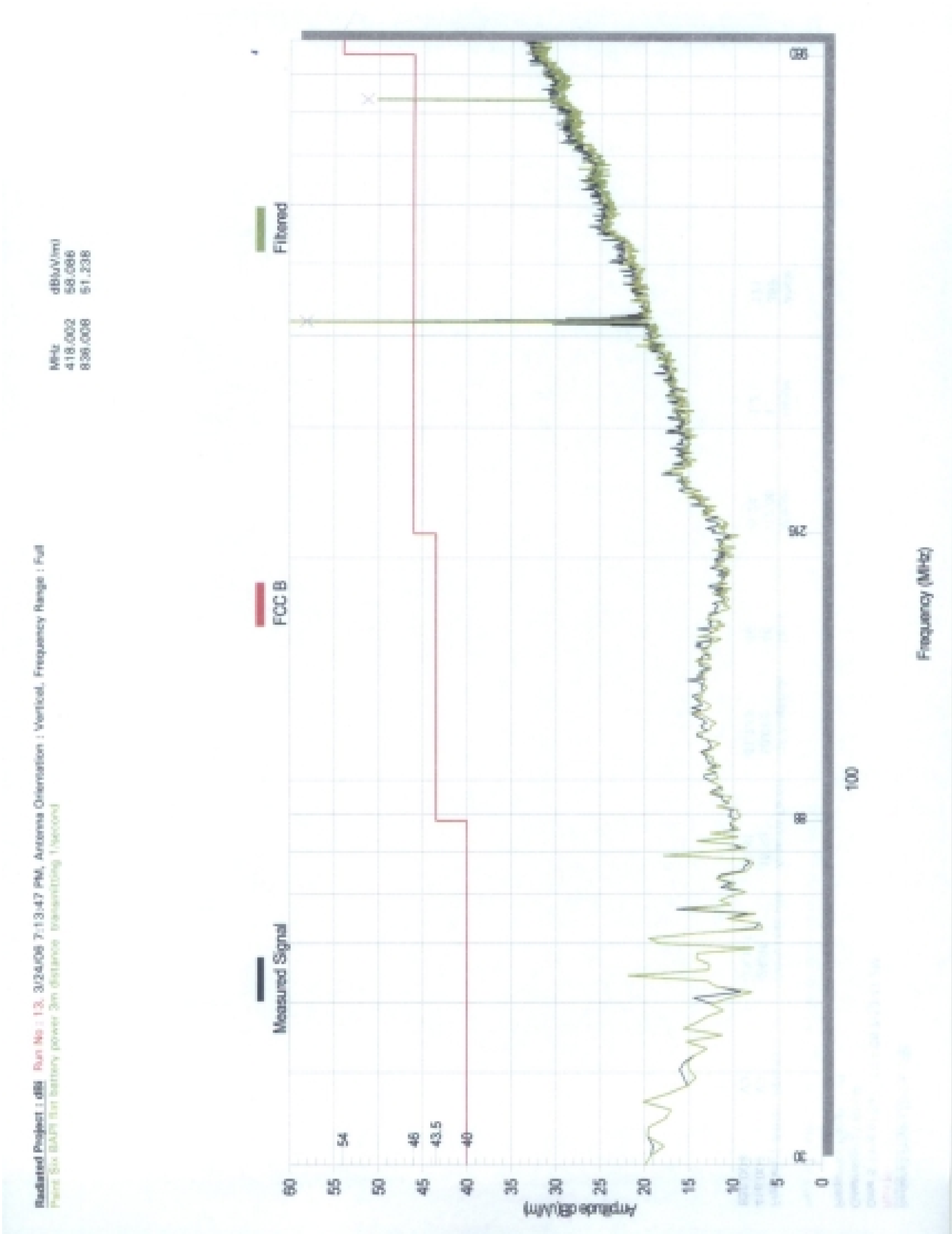
Note: Radiated measurements under 1,000MHz were performed at 3 meters in the Lexmark 5m semi-anechoic chamber, and radiated measurements over 1,000MHz were performed at 3m in the 10m semi-anechoic chamber, both located at Lexington, KY.

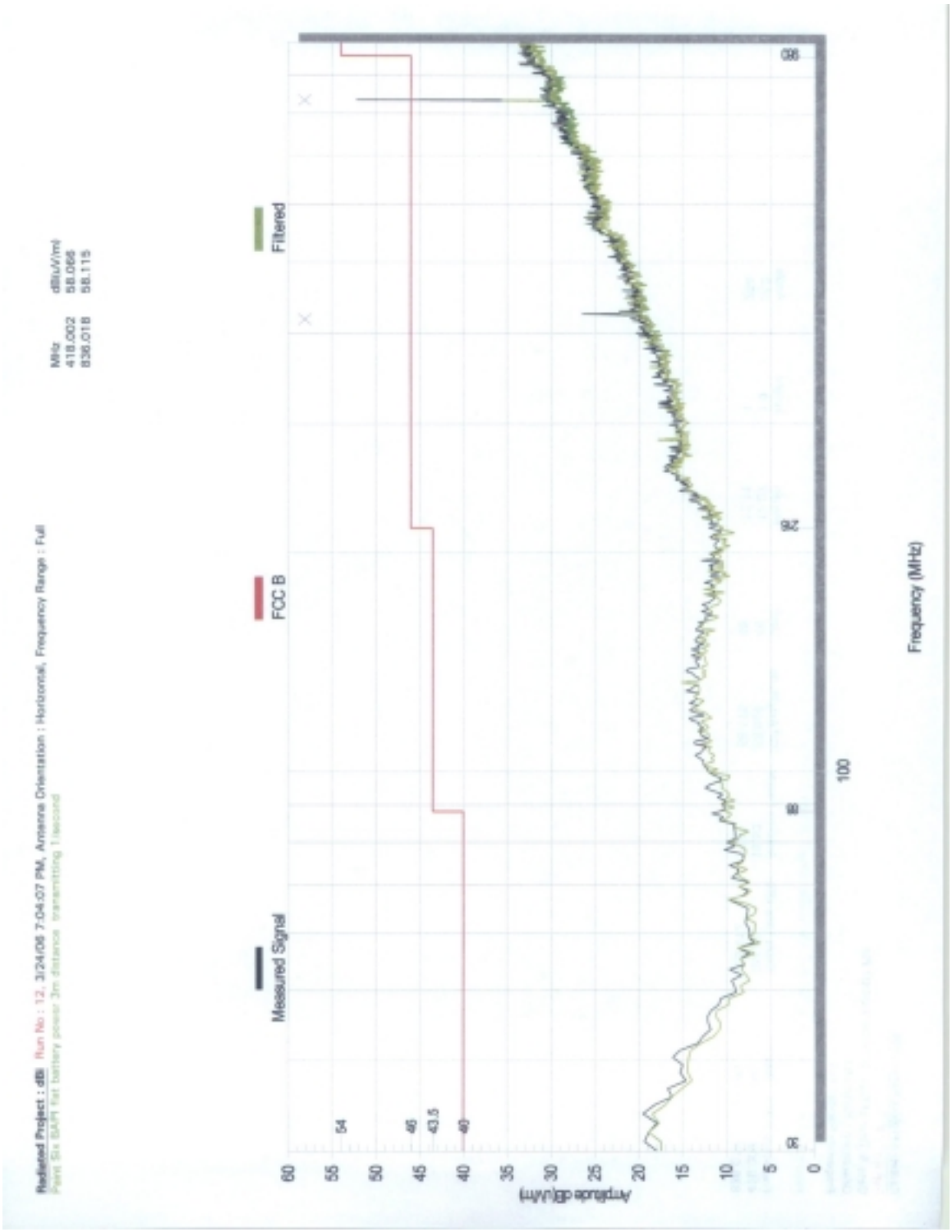
PROCEDURE: Test Performed Per ANSI 63.4 – 2003.

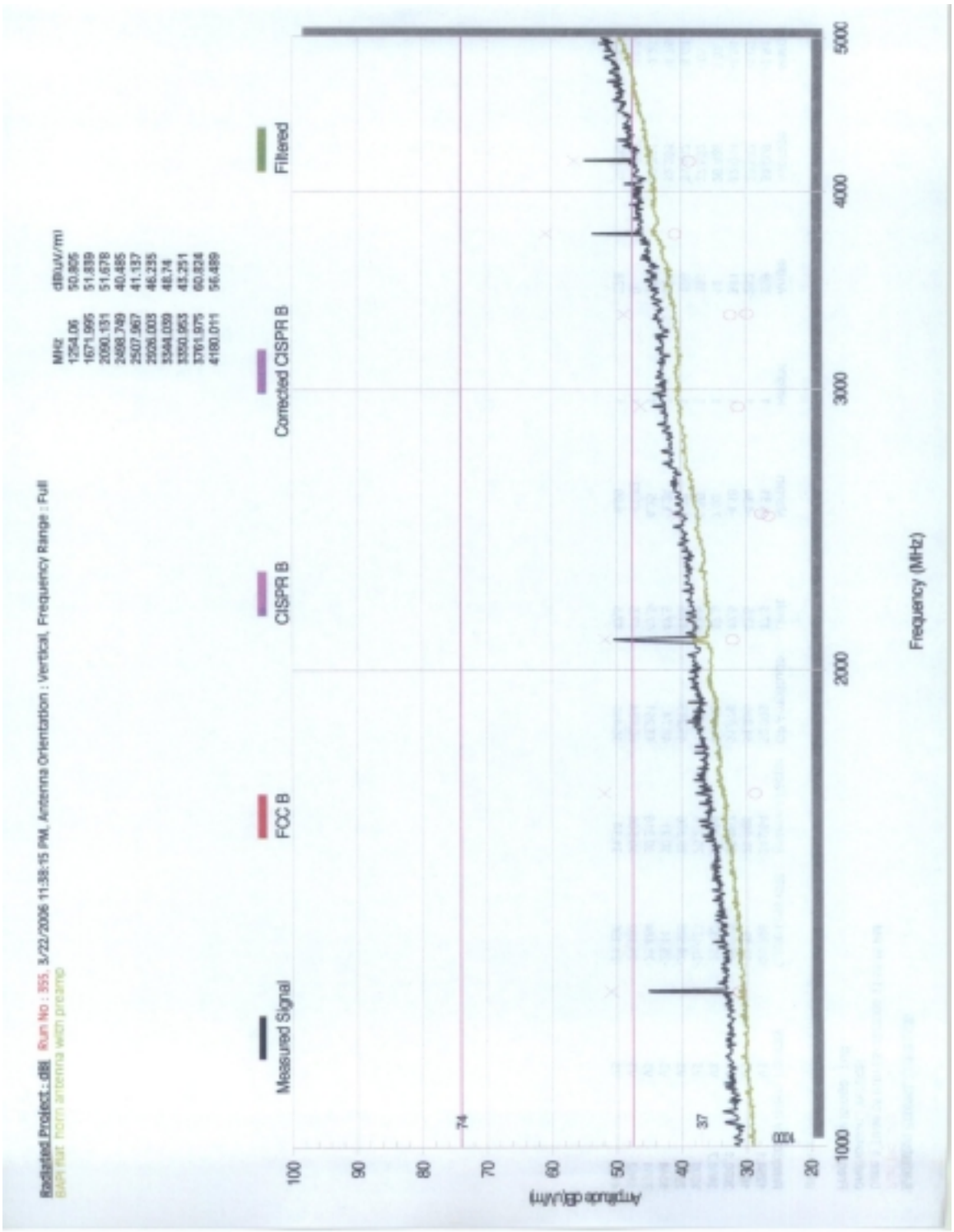


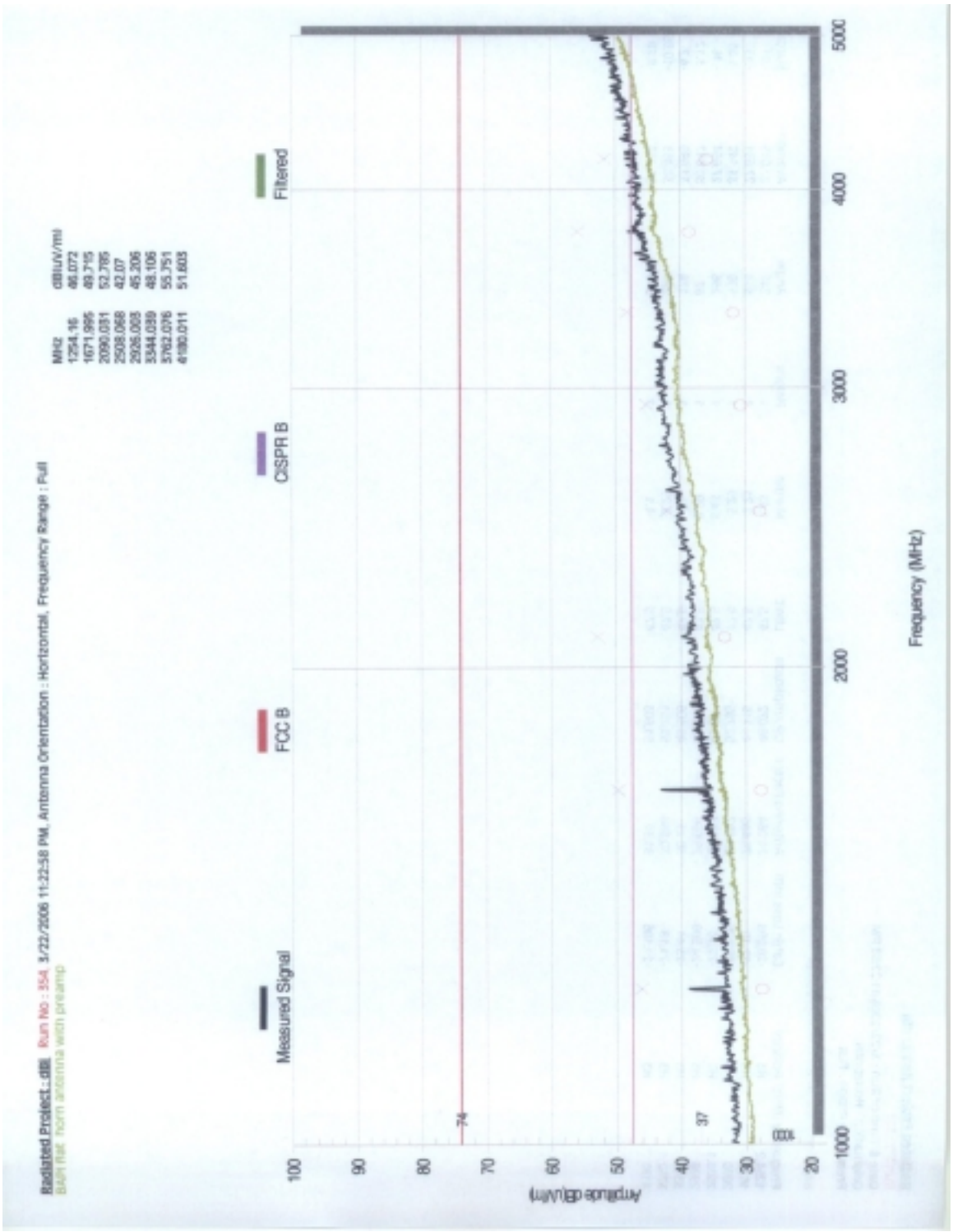
Signed_____Date April 13, 2006

John R. Barnes, PRESIDENT dBi Corporation


Measured Signal
FCC B
Filtered
MHz
418.002
838.008
dBuV/m
58.086
51.238
Amplitude dB(uV/m)
Frequency (MHz)
100


Radiated Project : dB Run No : 12, 3/24/06 7:04:07 PM, Antenna Orientation : Horizontal, Frequency Range : Full
Point Six 6APT flat battery power 3m distance transmitting 1 second
MHz dBuV/m
418.002 58.066
836.018 58.115
Filtered
FCC B
Measured Signal
54
46
43.5
40
60
55
50
45
40
35
30
25
20
15
10
5
0
Amplitude dB(uV/m)
88
92
98
100
Frequency (MHz)


Radiated Protect - dBi Run No : 355, 3/22/2006 11:38:15 PM, Antenna Orientation : Vertical, Frequency Range : Full
BAR Rat horn antenna with preamp
Measured Signal
FCC B
CISPR B
Corrected CISPR B
Filtered
MHz dBuV/m
1254.06 50.805
1671.995 51.839
2090.131 51.678
2508.749 40.485
2507.967 41.137
2926.003 46.235
3344.039 48.74
3350.953 43.251
3761.975 60.824
4180.011 56.489
74
37
Amplitude dB(uV/m)
Frequency (MHz)
100
90
80
70
60
50
40
30
20
1000
2000
3000
4000
5000


Radiated Project : dBi Run No : 354 3/22/2006 11:22:58 PM, Antenna Orientation : Horizontal, Frequency Range : Full
Bath Rat horn antenna with preamp
MHz dBuV/mi
1254.16 46.072
1671.995 49.715
2090.031 52.785
2508.068 42.07
2926.003 45.206
3344.039 48.106
3762.076 55.751
4180.011 51.603
Measured Signal
FCC B
CISPR B
Filtered
Amplitude dBuV/m
Frequency (MHz)
74
37
100
90
80
70
60
50
40
30
20
1000
2000
3000
4000
5000

Transmitted Bandwidth Data

Appliance/Product: Temperature/Humidity Sensor
Model/Type Number: BA/BS2-WTHT
FCC ID: T4F16963N16964
Rating: 3.6Vdc (Lithium batteries)
Serial Number: 60357000

Test Results: The 20dB transmitted bandwidth of the Temperature/Humidity Sensor is 16.2kHz (418.0099MHz to 417.9937MHz), well within the 1045kHz (0.25% of 418MHz) maximum bandwidth permitted by FCC Part 15 Section 15.231(c). In the photo, each horizontal division is 10kHz, and each vertical division is 10dB. The RBW bandwidth was 2kHz, and the VBW bandwidth was 2kHz, with a sweep time of 76ms.

PROCEDURE: Test Performed Per ANSI 63.4 – 2003.

Signed_____**Date** __March 27, 2006__
John R. Barnes, PRESIDENT dBi Corporation

Conducted Emissions 150 kHz-30 MHz (Internal Battery)

Conducted Emission Standards:
FCC 47 CFR Part 15-2005, using ANSI C63.4-2003

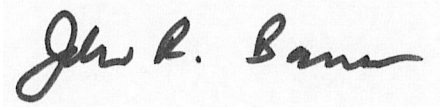
Appliance/Product: Temperature/Humidity Sensor
Model/Type Number: BA/BS2-WTHT
FCC ID: T4F16963N16964
Rating: 3.6Vdc (Lithium batteries)
Serial Number: 60357000

Host and Other Peripherals: None

Name of Test: Powerline Conducted Interference
Test Procedure: ANSI C63.4-2003
Test Location: All welded 18 ft x 18 ft shielded enclosure, Lexmark test facility, located in Lexington, Kentucky
Test Instrumentation: See attached sheets

Note: none

Test Results: This unit gets power from an internal battery. Therefore it meets the Class B conducted interference requirements of FCC Part 15 without testing.



SIGNED_____**DATE** __March 27, 2006__
John R. Barnes, PRESIDENT dBi Corp.

TESTING AND MEASURING EQUIPMENT USED AT LEXMARK

Radiated Interference and Bandwidth Measurements 30-1,000MHz:

Rohde & Schwarz	ESI40, S/N 839283/008
EMI Test Receiver #0543	(Cal date: 4/12/05, Cal due date: 4/12/07)
Schaffner-Chase	CBL6111C, S/N 2460
BI-Log Antenna 30 to 1000 MHz #0507	(Cal date: 9/12/05, Cal due date: 9/12/07)

Radiated Interference Measurements 1,000-5,000MHz:

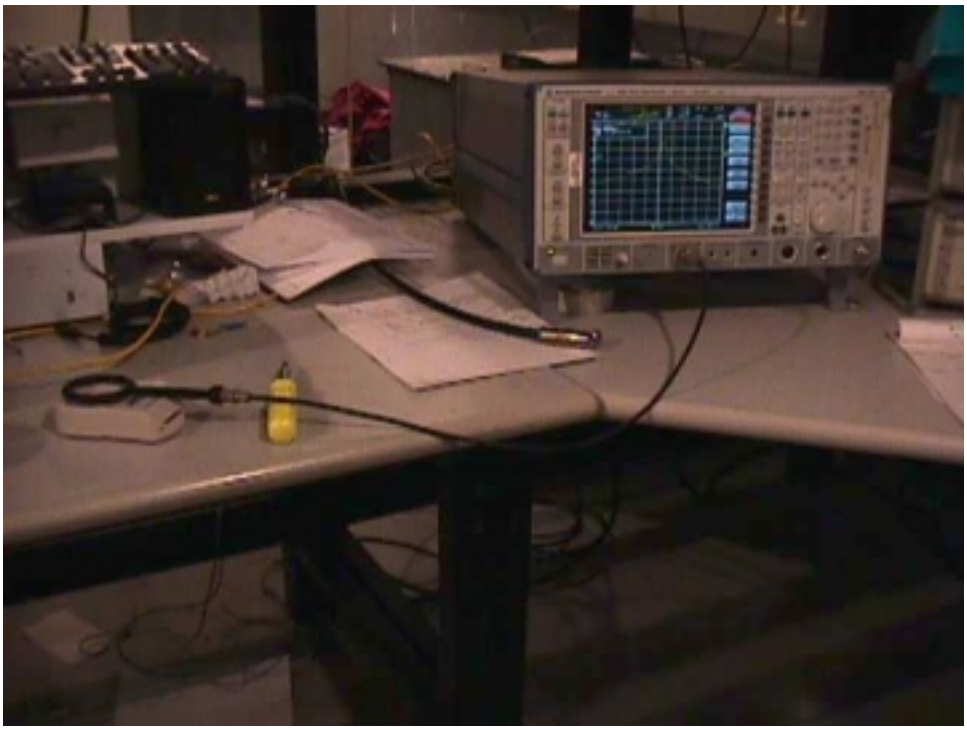
Rohde & Schwarz	ESIB40, S/N 100148
EMI Test Receiver #0700	(Cal date: 5/5/05, Cal due date: 5/5/07)
Rohde & Schwarz	ESI7, S/N 100009
EMI Test Receiver #0549	(Cal date: 6/14/05, Cal due date: 6/14/06)
ARA	DRG-118/A, S/N 1091
Horn Antenna, 1GHz to 18GHz #0389	(Cal date: 12/1997, Cal due date: not needed)

Calibration: The measuring equipment used at Lexmark is calibrated according to the instruction manual once a day. Once a week the accuracy of the test system is checked. This includes the test equipment, associated cables, and antennas. This is accomplished with a calibrated radiating source for the radiated measurements, and a synthesized signal generator for the conducted measurements.

FCC MAXIMUM-RADIATED-EMISSIONS TEST CONFIGURATIONS
TEMPERATURE/HUMIDITY SENSOR
10m SEMIANECHOIC CHAMBER
LEXMARK INTERNATIONAL, LEXINGTON KY.

FCC 30-1,000MHz RADIATED EMISSIONS TEST CONFIGURATION
TEMPERATURE/HUMIDITY SENSOR
5m SEMIANECHOIC CHAMBER
LEXMARK INTERNATIONAL, LEXINGTON KY.

FCC 1,000-4,180MHz RADIATED EMISSIONS TEST CONFIGURATION
TEMPERATURE/HUMIDITY SENSOR
10m SEMIANECHOIC CHAMBER
LEXMARK INTERNATIONAL, LEXINGTON KY.



FCC TRANSMITTED BANDWIDTH TEST CONFIGURATION
TEMPERATURE/HUMIDITY SENSOR
10m/5m SEMIANECHOIC CHAMBER CONTROL ROOM
LEXMARK INTERNATIONAL, LEXINGTON KY.