dBi Corporation

FCC Certification Test Report

BAPI BA/WT-D-BB, BA/WTH-D-BB, and BA/BS2-WTH-SO Wireless Sensors

Report Number 07dBi001a

(this test report replaces test report 07dBi001)

Testing Certificate #1985.01

ADMINISTRATIVE INFORMATION

Historical record:
Because dBi Corporation is a testing entity, and not a manufacturer, this original test report of the BA/WT-D-BB, BA/WTH-D-BB, and BA/BS2-WTH-SO wireless sensors is being transmitted to the manufacturer, Building Automation Products, Inc. dBi will keep a copy for its historical records and to satisfy A2LA-Audit requirements. We strongly recommend archiving the units that we tested, to facilitate answering future inquiries regarding these products.

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 test 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 Marking 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 samples tested. The manufacturer is responsibility for ensuring that the production models of these wireless sensors comply with the FCC and CE Marking requirements, and continue to comply throughout their manufacturing life. The manufacturer should check any changes to the products that could change their 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

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 18 June 2005*).

Presented this 30th day of October 2006.

President
For the Accreditation Council
Certificate Number 1985.01
Valid to September 30, 2008

For the 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 17025:2005

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

ELECTRICAL (EMC)

Valid To: September 30, 2008 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 ANSIC63.4:2003) AS/NZS 3548:1995, AS/NZS CISPR 22:2004, 2002 CISPR 22:2003, 1997, 1993 EN 55022:1994, 1998 VCCI 2002, 2006
Conducted Emissions	CFR 47, FCC Method Part 15, Class A and B (using ANSI C63.4:2003) AS/NZS 3548:1995; AS/NZS CISPR 22:2004, 2002; CISPR 22:2003, 1997, 1993 EN 55022:1994, 1998 VCCI 2002, 2006
Harmonics	IEC 61000-3-2:2000, EN 61000-3-2:2000
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

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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)

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ADMINISTRATIVE DATA

Manufacturer:

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

Appliance/Product: temperature sensor
Model/Type Number: BA/WT-D-BB
FCC ID: xxxxxxxxxx
Rating: 3.6Vdc (Lithium batteries)

Appliance/Product: temperature/humidity sensor
Model/Type Number: BA/WTH-D-BB
FCC ID: xxxxxxxxxx
Rating: 3.6Vdc (Lithium batteries)

Appliance/Product: temperature/humidity sensor
Model/Type Number: BA/BS2-WTH-SO
FCC ID: xxxxxxxxxx
Rating: 3.6Vdc (Lithium batteries)

Suppression Components: see attached sheets.
Measurement Equipment used: see attached sheets.
Measurements According to, and Sample Units Comply with: FCC 47 CFR Part 15-2006
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: January 19-25, 2007 and March 8, 2007 **at:**

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

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

John R. Barnes

SIGNED________________________________**DATE**__March 8, 2007__

John R. Barnes, PRESIDENT dBi Corp.

INFORMATION RELATING TO PRODUCT RF INTERFERENCE

Appliance/Product: temperature sensor
Model/Type Number: BA/WT-D-BB
FCC ID: xxxxxxxxxxx
Rating: 3.6Vdc (Lithium batteries)

Suppression Components:
Steward 28A0392-0A0 snap-on ferrite on sensor cable.
Steward 28A0392-0A0 snap-on ferrite on DC power cable.

Clock Frequencies: 8MHz, and 418MHz

Cables: none.

Electronic Printed Circuit Boards:

Transmitter board	P/N 18550
Antenna	P/N SM060209
Battery board	P/N SM060811C

Size of Product: 127mm x 102mm x 76mm high, with a 290mm x 6mm diameter probe

Weight of Product: 450g

INFORMATION RELATING TO PRODUCT RF INTERFERENCE (cont.)

Appliance/Product: temperature/humidity sensor
Model/Type Number: BA/WTH-D-BB
FCC ID: xxxxxxxxxx
Rating: 3.6Vdc (Lithium batteries)

Suppression Components:
Steward 28A0392-0A0 snap-on ferrite on sensor cable.
Steward 28A0392-0A0 snap-on ferrite on DC power cable.

Clock Frequencies: 8MHz, and 418MHz

Cables: none.

Electronic Printed Circuit Boards:

Transmitter board	P/N 18550
Antenna	P/N SM060209
Battery board	P/N SM060811C

Size of Product: 127mm x 102mm x 76mm high, with a 146mm x 20mm diameter probe

Weight of Product: 450g

INFORMATION RELATING TO PRODUCT RF INTERFERENCE (cont.)

Appliance/Product: temperature/humidity sensor
Model/Type Number: BA/BS2-WTH-SO
FCC ID: xxxxxxxxxx
Rating: 3.6Vdc (Lithium batteries)

Suppression Components: none.

Clock Frequencies: 8MHz, and 418MHz

Cables: none.

Electronic Printed Circuit Boards:

Transmitter board	P/N SM061213
Antenna	P/N SM060209

Size of Product: 70mm x 25mm x 114mm high

Weight of Product: 150g

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

Radiated Emission Standards:
FCC 47 CFR Part 15-2006, using ANSI C63.4-2003; section 15.231(e) limits for 418MHz.

Appliance/Product: temperature sensor
Model/Type Number: BA/WT-D-BB
FCC ID: xxxxxxxxxx
Rating: 3.6Vdc (Lithium batteries)
Serial Number: 61150004

Appliance/Product: temperature/humidity sensor
Model/Type Number: BA/WTH-D-BB
FCC ID: xxxxxxxxxx
Rating: 3.6Vdc (Lithium batteries)
Serial Number: 70144004

Appliance/Product: temperature/humidity sensor
Model/Type Number: BA/BS2-WTH-SO
FCC ID: xxxxxxxxxx
Rating: 3.6Vdc (Lithium batteries)
Serial Number: 70151000

Host and Other Peripherals: None

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

Notes: Transmitting at 1 second intervals to speed up testing.

On a sensor that was initially slightly over the FCC Part 15.231(e) limit at 418MHz, we measured peak (PK+), quasi-peak (QP), and average (AVE) at 418MHz with 0dB, 10dB, 20dB, and 30dB attenuation at the bi-con antenna. The PK+ measurements changed by less than 10dB when we went from 0 to 10dB, and then from 10 to 20dB attenuation, indicating signal compression in the preamp/receiver chain. PK+, QP, and AVE all changed by about 10dB when we went from 20 to 30dB attenuation, showing that we needed somewhere between 10 and 20dB attenuation for accurate measurements below 1000MHz. at the specified radiated-power level. (This matched our experiences testing some previous FCC Part 15.231(e) products.) But too much attenuation would push weak signals below the receivers noise floor, making AVE measurements inaccurate. We compromised by making all subsequent measurements for 30-1000MHz with a calibrated 20dB attenuator on the bi-con antenna, adding its loss (20.194dB at 418MHz, 20.15dB at 836MHz) to the measured field strength.

For measurements above 1GHz, we used a different antenna and preamp. The FCC Part 15.231(e) limits in this range are well below the FCC Class A limits, and thus any linearity concerns had already been addressed during equipment calibration.

Due to software limitations, we had to measure PK+, QP, and AVE for 418MHz and its harmonics in manual mode, as follows:

1. With the equipment-under-test (EUT) upright, measure 418MHz and 836MHz in QP mode with the bi-con antenna vertical and horizontal (Lexmark's EMC software records the azimuth and elevation of the QP peaks).
2. Repeat step 1 with the EUT on its back.
3. Repeat step 1 with the EUT on its right side.
4. Study the plots to determine which orientation of the EUT had the highest emissions in QP mode.
5. Return the EUT to this position. With the bi-con antenna vertical, go back to the azimuth and elevation that maximized the QP emissions at a given frequency.
6. Using a 1 second sampling time, measure PK+ and QP, taking the maximum values seen on the receiver over 10-20 seconds. If we still suspected signal compression, we increased the attenuation of the receiver's front-end by 10dB. If the measurement stayed the same, we used the previous reading. If the value increased, we continued increasing the attenuation in 10dB steps until the measurement stayed the same, then reduced the attenuation 10dB for the official measurement.
7. Using a 100 millisecond sampling time, measure AVE, taking taking the maximum value seen on the receiver over 10-20 seconds. (Since we could only catch the top 2 digits, we used 0.99dB as the fractional part to be conservative.)
8. In the calculations, add the attenuator's loss to the measured value to get the real field strength.
9. Repeat steps 5 to 8 with the bi-con antenna horizontal.
10. Put the EUT(s) on the table in the position(s) that mazimized 418MHz Radiated Emissions.
11. Measure 1254MHz, 1672MHz, …, 4180MHz in PK+ mode with the horn antenna vertical and horizontal (the software records the azimuth of the PK+ and AVE peaks, elevation was 1m).
12. With the horn antenna vertical, go to the recorded azimuth that maximized each PK+ peak.
13. Using a 1 second sampling time, measure PK+, taking the maximum values seen on the receiver over 10-20 seconds.
14. Using a 100 millisecond sampling time, measure AVE, taking taking the maximum value seen on the receiver over 10-20 seconds. (Since we could only catch the top 2 digits, we used 0.99dB as the fractional part to be conservative.)
15. Repeat steps 12 to 14 with the horn antenna horizontal.

For measurements from 30MHz-1,000 MHz the 6dB resolution bandwidth (RBW) was 120kHz. Above 1,000MHz the 6dB RBW was 1MHz. All measurements were made in EMI Receiver mode, so according to the receiver specifications, video bandwidth (VBW) doesn't apply, the bandwidth error is under 10% and the shape factor (B(60dB)/B(6dB)) is under 10.

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).

The maximum transmit time for these sensors is 8ms. Averaged over a 100ms sample time, the AVE measurement should be about 20*log(8ms/100ms) = -21.938dB from PK+ measurements. The measured difference may be less if the AVE signal level is under the noise floor of the receiver, artificially increasing its value. On a previous product we were told that for pulsed emissions, that the AVE emissions must be calculated by *subtracting* a duty-cycle correction factor = 20*log(worst case ON-TIME (ms) in any 100ms window / 100 ms) from the peak value, with the duty-cycle correction factor between 0dB and 20dB. (There is a sign error in the description we were given, because log of a number between 0 and 1 is negative.) We have not found this requirement documented anywhere in the FCC Regulations or in ANSI C63.4-2003, but to keep everyone happy, we show both *measured* AVE values and *calculated* AVE values for these sensors.

On the BA/WT-D-BB we had to:

- Unsolder the antenna card from the support pin, and bend the other pin so that the antenna card lies flat in the bottom of the housing.
- Put a Steward 28A0392-0A0 snap-on ferrite on the DC power cable.
- Route the sensor cable and the DC power cable along the top of the housing.

On the BA/WTH-D-BB we had to:

- Unsolder the antenna card from the support pin, and bend the other pin so that the antenna card lies flat in the bottom of the housing.
- Put Steward 28A0392-0A0 snap-on ferrites on the sensor cable and the DC power cable.
- Route the sensor cable and the DC power cable along the top of the housing.
- Twist the sensor cable and the DC power cable about 3 turns/inch.

On the BA/BS2-WTH-SO we had to run a strip of copper tape over the slide potentiometer, soldered to the bottom of the card at both ends.

Test Results: With these modifications, tables 1 through 12, and the Transmitted Bandwidth Data show that these units meet the radiated interference requirements of FCC Part 15 Section 15.231(e).

John R. Barnes

SIGNED________________________________DATE March 8, 2007

John R. Barnes, PRESIDENT dBi Corp.

Radiated Emissions Data 30-4,180MHz (BA/WT-D-BB)

TABLE 1 PEAK EMISSIONS

Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)*	Receiver Reading Horiz. (dB(uV)*	Cable Correction Factor dB	Antenna Factor dB(/m)	Radiated Interference Field Strength Vert. dB(uV/m)	Radiated Interference Field Strength Horiz. dB(uV/m)	15.231(e) Peak Limit dB(uV/m)
418.03	93.024	94.324	-25.210	16.720	84.534	85.834	92.33
836.06	52.830	54.630	-23.631	23.241	52.440	54.240	72.33
1254.10	66.324	67.194	-29.787	23.563	60.100	60.970	72.33
1672.13	63.132	64.182	-28.238	24.816	59.710	60.760	72.33
2090.17	55.934	40.704	-27.522	26.178	54.590	39.360	72.33
2508.20	46.002	46.592	-27.197	27.935	46.740	47.330	72.33
2926.23	36.075	34.805	-26.406	29.691	39.360	38.090	72.33
3344.27	40.147	35.157	-25.881	30.344	44.610	39.620	72.33
3762.30	50.254	47.754	-25.026	30.762	55.990	53.490	72.33
4180.34	41.798	38.288	-24.720	31.522	48.600	45.090	72.33

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

TABLE 2 QUASIPEAK EMISSIONS

Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)*	Receiver Reading Horiz. (dB(uV)*	Cable Correction Factor dB	Antenna Factor dB(/m)	Radiated Interference Field Strength Vert. dB(uV/m)	Radiated Interference Field Strength Horiz. dB(uV/m)	15.231(e) Quasipeak Limit dB(uV/m)
418.03	88.464	89.734	-25.210	16.720	79.974	81.244	
836.06	46.180	48.350	-23.631	23.241	45.790	47.960	

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

John R. Barnes

Signed______________________________________**Date** March 8, 2007

John R. Barnes, PRESIDENT dBi Corporation

Radiated Emissions Data 30-4,180MHz (BA/WT-D-BB, cont.)

TABLE 3 MEASURED AVERAGE EMISSIONS

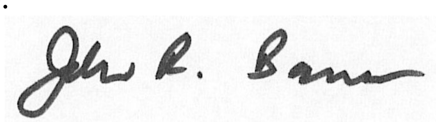
Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)*	Receiver Reading Horiz. (dB(uV)*	Cable Correction Factor dB	Antenna Factor dB(/m)	Radiated Interference Field Strength Vert. dB(uV/m)	Radiated Interference Field Strength Horiz. dB(uV/m)	15.231(e) Average Limit dB(uV/m)
418.03	72.674	73.674	-25.210	16.720	64.184	65.184	72.33
836.06	37.530	38.530	-23.631	23.241	37.140	38.140	52.33
1254.10	46.214	34.214	-29.787	23.563	39.990	27.990	52.33
1672.13	39.412	41.412	-28.238	24.816	35.990	37.990	52.33
2090.17	36.334	24.334	-27.522	26.178	34.990	22.990	52.33
2508.20	27.252	28.252	-27.197	27.935	27.990	28.990	52.33
2926.23	20.705	19.705	-26.406	29.691	23.990	22.990	52.33
3344.27	21.527	18.527	-25.881	30.344	25.990	22.990	52.33
3762.30	30.254	27.254	-25.026	30.762	35.990	32.990	52.33
4180.34	22.188	20.188	-24.720	31.522	28.990	26.990	52.33

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

TABLE 4 CALCULATED AVERAGE EMISSIONS

Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)*	Receiver Reading Horiz. (dB(uV)*	Cable Corr. Factor dB	Antenna Factor dB(/m)	Duty-cyc. Corr. Factor dB**	Radiated Interf. Field Strength Vert. dB(uV/m)	Radiated Interf. Field Strength Horiz. dB(uV/m)	15.231e Average Limit dB(uV/m)
418.03	93.024	94.324	-25.210	16.720	-20.000	64.534	65.834	72.33
836.06	52.830	54.630	-23.631	23.241	-20.000	32.440	34.240	52.33
1254.10	66.324	67.194	-29.787	23.563	-20.000	40.100	40.970	52.33
1672.13	63.132	64.182	-28.238	24.816	-20.000	39.710	40.760	52.33
2090.17	55.934	40.704	-27.522	26.178	-20.000	34.590	19.360	52.33
2508.20	46.002	46.592	-27.197	27.935	-20.000	26.740	27.330	52.33
2926.23	36.075	34.805	-26.406	29.691	-20.000	19.360	18.090	52.33
3344.27	40.147	35.157	-25.881	30.344	-20.000	24.610	19.620	52.33
3762.30	50.254	47.754	-25.026	30.762	-20.000	35.990	33.490	52.33
4180.34	41.798	38.288	-24.720	31.522	-20.000	28.600	25.090	52.33

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



Signed______________________________________**Date** __March 8, 2007__

John R. Barnes, PRESIDENT dBi Corporation

Radiated Emissions Data 30-4,180MHz (BA/WTH-D-BB)

TABLE 5 PEAK EMISSIONS

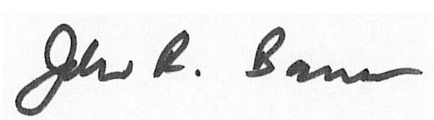
Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)*	Receiver Reading Horiz. (dB(uV)*	Cable Correction Factor dB	Antenna Factor dB(/m)	Radiated Interference Field Strength Vert. dB(uV/m)	Radiated Interference Field Strength Horiz. dB(uV/m)	15.231(e) Peak Limit dB(uV/m)
418.03	91.894	84.874	-25.210	16.720	83.404	76.384	92.33
836.06	59.360	59.560	-23.631	23.241	58.970	59.170	72.33
1254.10	60.334	66.984	-29.787	23.563	54.110	60.760	72.33
1672.13	39.992	55.932	-28.238	24.816	36.570	52.510	72.33
2090.17	51.334	53.434	-27.522	26.178	49.990	52.090	72.33
2508.20	44.182	35.082	-27.197	27.935	44.920	35.820	72.33
2926.23	33.535	37.095	-26.406	29.691	36.820	40.380	72.33
3344.27	32.227	38.307	-25.881	30.344	36.690	42.770	72.33
3762.30	48.764	49.794	-25.026	30.762	54.500	55.530	72.33
4180.34	41.948	51.918	-24.720	31.522	48.750	58.720	72.33

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

TABLE 6 QUASIPEAK EMISSIONS

Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)*	Receiver Reading Horiz. (dB(uV)*	Cable Correction Factor dB	Antenna Factor dB(/m)	Radiated Interference Field Strength Vert. dB(uV/m)	Radiated Interference Field Strength Horiz. dB(uV/m)	15.231(e) Quasipeak Limit dB(uV/m)
418.03	87.434	80.294	-25.210	16.720	78.944	71.804	
836.06	53.890	53.890	-23.631	23.241	53.500	53.500	

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



Signed_____________________________________**Date** __March 8, 2007__

John R. Barnes, PRESIDENT dBi Corporation

Radiated Emissions Data 30-4,180MHz (BA/WTH-D-BB, cont.)

TABLE 7 MEASURED AVERAGE EMISSIONS

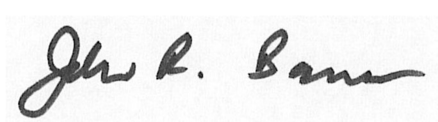
Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)*	Receiver Reading Horiz. (dB(uV)*	Cable Correction Factor dB	Antenna Factor dB(/m)	Radiated Interference Field Strength Vert. dB(uV/m)	Radiated Interference Field Strength Horiz. dB(uV/m)	15.231(e) Average Limit dB(uV/m)
418.03	71.674	64.674	-25.210	16.720	63.184	56.184	72.33
836.06	47.530	47.530	-23.631	23.241	47.140	47.140	52.33
1254.10	39.214	47.214	-29.787	23.563	32.990	40.990	52.33
1672.13	25.412	33.412	-28.238	24.816	21.990	29.990	52.33
2090.17	32.334	33.334	-27.522	26.178	30.990	31.990	52.33
2508.20	26.252	21.252	-27.197	27.935	26.990	21.990	52.33
2926.23	17.705	20.705	-26.406	29.691	20.990	23.990	52.33
3344.27	16.527	19.527	-25.881	30.344	20.990	23.990	52.33
3762.30	29.254	30.254	-25.026	30.762	34.990	35.990	52.33
4180.34	22.188	30.188	-24.720	31.522	28.990	36.990	52.33

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

TABLE 8 CALCULATED AVERAGE EMISSIONS

Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)*	Receiver Reading Horiz. (dB(uV)*	Cable Corr. Factor dB	Antenna Factor dB(/m)	Duty-cyc. Corr. Factor dB**	Radiated Interf. Field Strength Vert. dB(uV/m)	Radiated Interf. Field Strength Horiz. dB(uV/m)	15.231e Average Limit dB(uV/m)
418.03	91.894	84.874	-25.210	16.720	-20.000	63.404	56.384	72.33
836.06	59.360	59.560	-23.631	23.241	-20.000	38.970	39.170	52.33
1254.10	60.334	66.984	-29.787	23.563	-20.000	34.110	40.760	52.33
1672.13	39.992	55.932	-28.238	24.816	-20.000	16.570	32.510	52.33
2090.17	51.334	53.434	-27.522	26.178	-20.000	29.990	32.090	52.33
2508.20	44.182	35.082	-27.197	27.935	-20.000	24.920	15.820	52.33
2926.23	33.535	37.095	-26.406	29.691	-20.000	16.820	20.380	52.33
3344.27	32.227	38.307	-25.881	30.344	-20.000	16.690	22.770	52.33
3762.30	48.764	49.794	-25.026	30.762	-20.000	34.500	35.530	52.33
4180.34	41.948	51.918	-24.720	31.522	-20.000	28.750	38.720	52.33

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



Signed_____________________________________**Date** __March 8, 2007__

John R. Barnes, PRESIDENT dBi Corporation

Radiated Emissions Data 30-4,180MHz (BA/BS2-WTH-SO)

TABLE 9 PEAK EMISSIONS

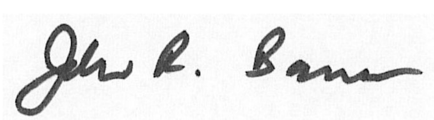
Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)*	Horiz. (dB(uV)*	Cable Correction Factor dB	Antenna Factor dB(/m)	Radiated Interference Field Strength Vert. dB(uV/m)	Horiz. dB(uV/m)	15.231(e) Peak Limit dB(uV/m)
418.03	87.624	90.964	-25.210	16.720	79.134	82.474	92.33
836.06	57.120	63.940	-23.631	23.241	56.730	63.550	72.33
1254.10	60.334	66.984	-29.787	23.563	54.110	60.760	72.33
1672.13	39.992	55.932	-28.238	24.816	36.570	52.510	72.33
2090.17	51.334	53.434	-27.522	26.178	49.990	52.090	72.33
2508.20	44.182	35.082	-27.197	27.935	44.920	35.820	72.33
2926.23	33.535	37.095	-26.406	29.691	36.820	40.380	72.33
3344.27	32.227	38.307	-25.881	30.344	36.690	42.770	72.33
3762.30	48.764	49.794	-25.026	30.762	54.500	55.530	72.33
4180.34	41.948	51.918	-24.720	31.522	48.750	58.720	72.33

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

TABLE 10 QUASIPEAK EMISSIONS

Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)*	Horiz. (dB(uV)*	Cable Correction Factor dB	Antenna Factor dB(/m)	Radiated Interference Field Strength Vert. dB(uV/m)	Horiz. dB(uV/m)	15.231(e) Quasipeak Limit dB(uV/m)
418.03	83.154	86.734	-25.210	16.720	74.664	78.244	
836.06	50.680	58.350	-23.631	23.241	50.290	57.960	

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



Signed____**Date** __March 8, 2007__

John R. Barnes, PRESIDENT dBi Corporation

Radiated Emissions Data 30-4,180MHz (BA/BS2-WTH-SO, cont.)

TABLE 11 MEASURED AVERAGE EMISSIONS

Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)*	Receiver Reading Horiz. (dB(uV)*	Cable Correction Factor dB	Antenna Factor dB(/m)	Radiated Interference Field Strength Vert. dB(uV/m)	Radiated Interference Field Strength Horiz. dB(uV/m)	15.231(e) Average Limit dB(uV/m)
418.03	66.674	69.674	-25.210	16.720	58.184	61.184	72.33
836.06	39.530	45.530	-23.631	23.241	39.140	45.140	52.33
1254.10	39.214	47.214	-29.787	23.563	32.990	40.990	52.33
1672.13	25.412	33.412	-28.238	24.816	21.990	29.990	52.33
2090.17	32.334	33.334	-27.522	26.178	30.990	31.990	52.33
2508.20	26.252	21.252	-27.197	27.935	26.990	21.990	52.33
2926.23	17.705	20.705	-26.406	29.691	20.990	23.990	52.33
3344.27	16.527	19.527	-25.881	30.344	20.990	23.990	52.33
3762.30	29.254	30.254	-25.026	30.762	34.990	35.990	52.33
4180.34	22.188	30.188	-24.720	31.522	28.990	36.990	52.33

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

TABLE 12 CALCULATED AVERAGE EMISSIONS

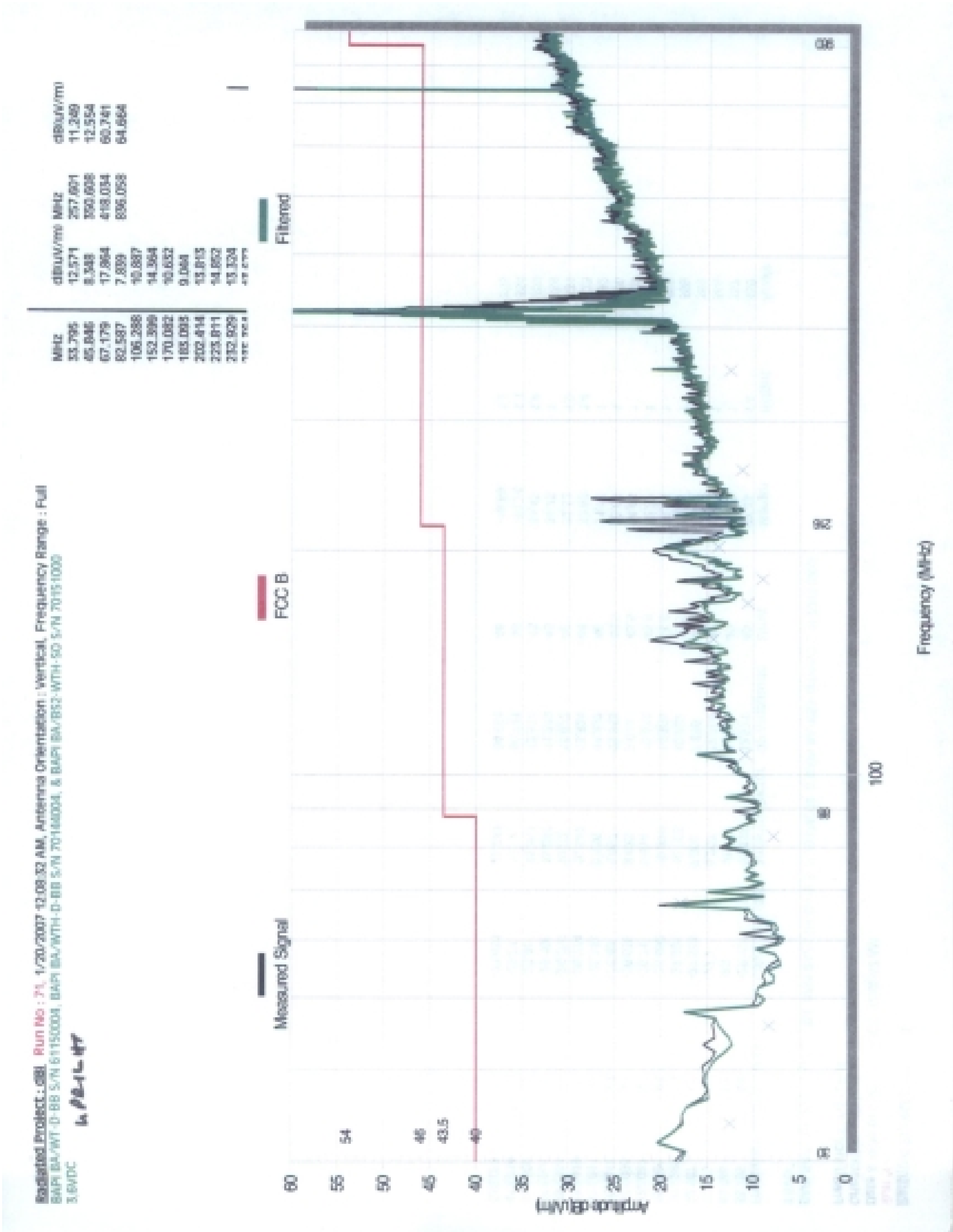
Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)*	Receiver Reading Horiz. (dB(uV)*	Cable Corr. Factor dB	Antenna Factor dB(/m)	Duty-cyc. Corr. Factor dB**	Radiated Interf. Field Strength Vert. dB(uV/m)	Radiated Interf. Field Strength Horiz. dB(uV/m)	15.231e Average Limit dB(uV/m)
418.03	87.624	90.964	-25.210	16.720	-20.000	59.134	62.474	72.33
836.06	57.120	63.940	-23.631	23.241	-20.000	36.730	43.550	52.33
1254.10	60.334	66.984	-29.787	23.563	-20.000	34.110	40.760	52.33
1672.13	39.992	55.932	-28.238	24.816	-20.000	16.570	32.510	52.33
2090.17	51.334	53.434	-27.522	26.178	-20.000	29.990	32.090	52.33
2508.20	44.182	35.082	-27.197	27.935	-20.000	24.920	15.820	52.33
2926.23	33.535	37.095	-26.406	29.691	-20.000	16.820	20.380	52.33
3344.27	32.227	38.307	-25.881	30.344	-20.000	16.690	22.770	52.33
3762.30	48.764	49.794	-25.026	30.762	-20.000	34.500	35.530	52.33
4180.34	41.948	51.918	-24.720	31.522	-20.000	28.750	38.720	52.33

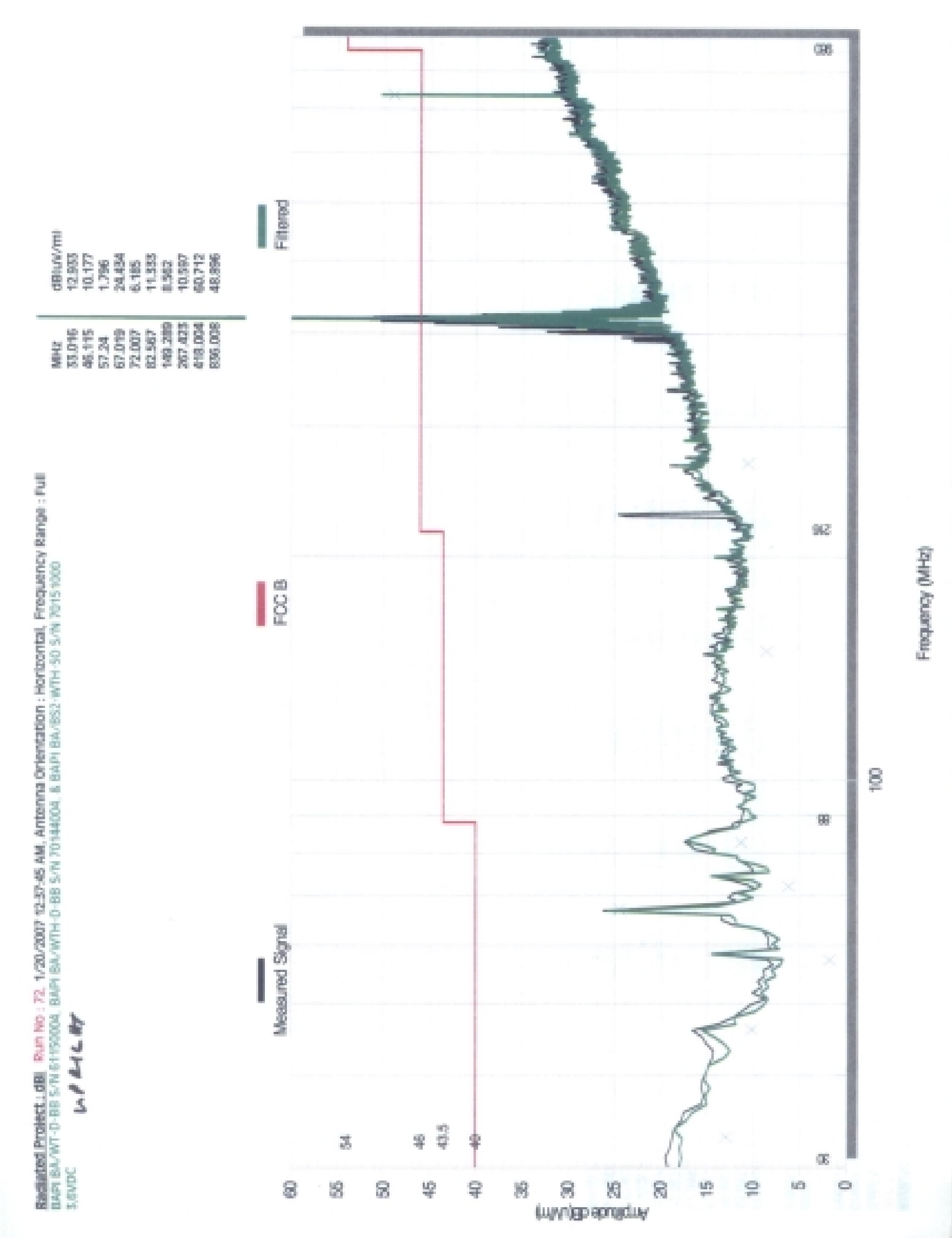
Sample Calculation: Receiver reading dB(uV) plus cable correction factor (dB) plus antenna factor dB(/m) plus duty-cycle correction factor equals Radiated Interference Field Strength dB(uV/m).

John R. Barnes

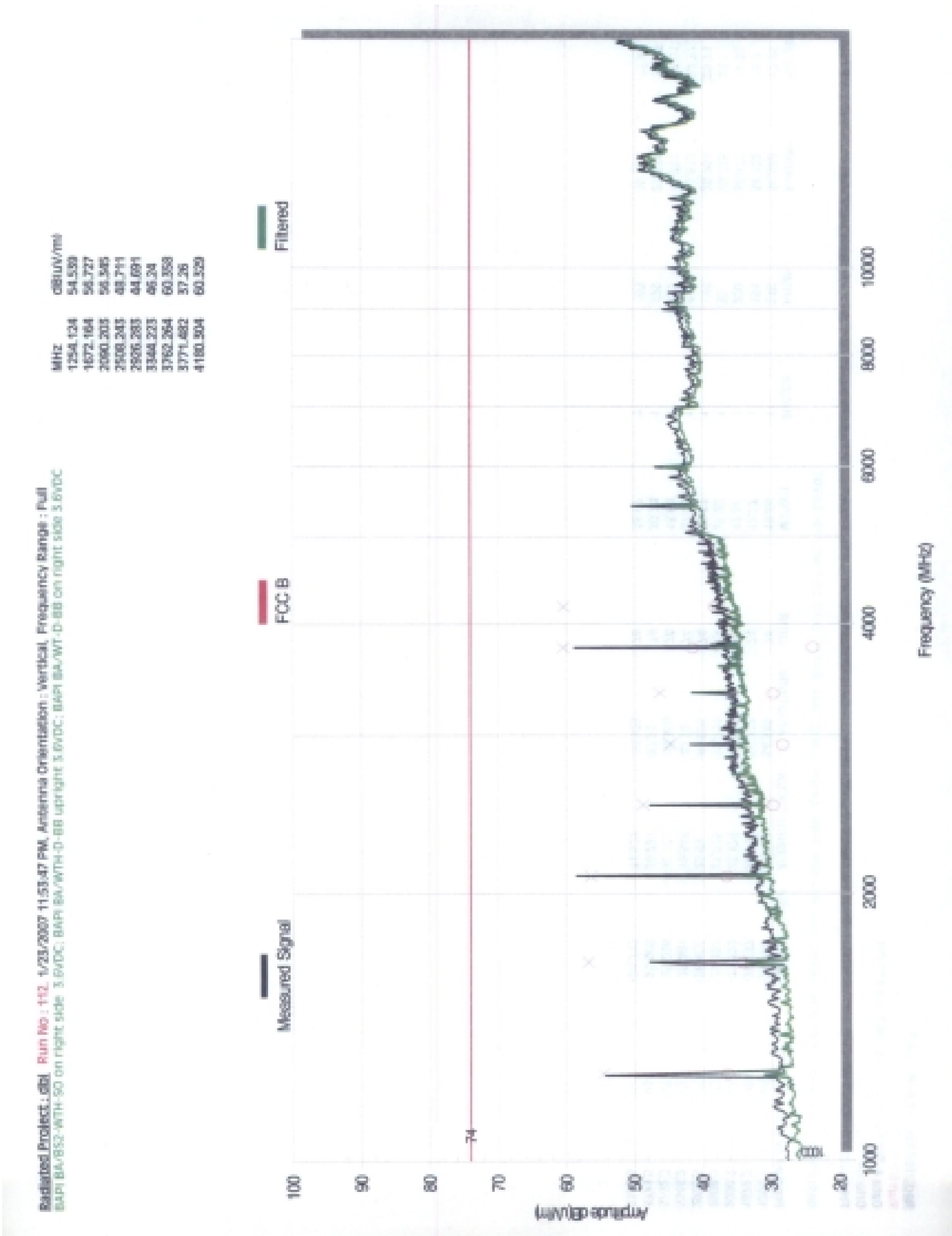
Signed______________________________________**Date** __March 8, 2007__

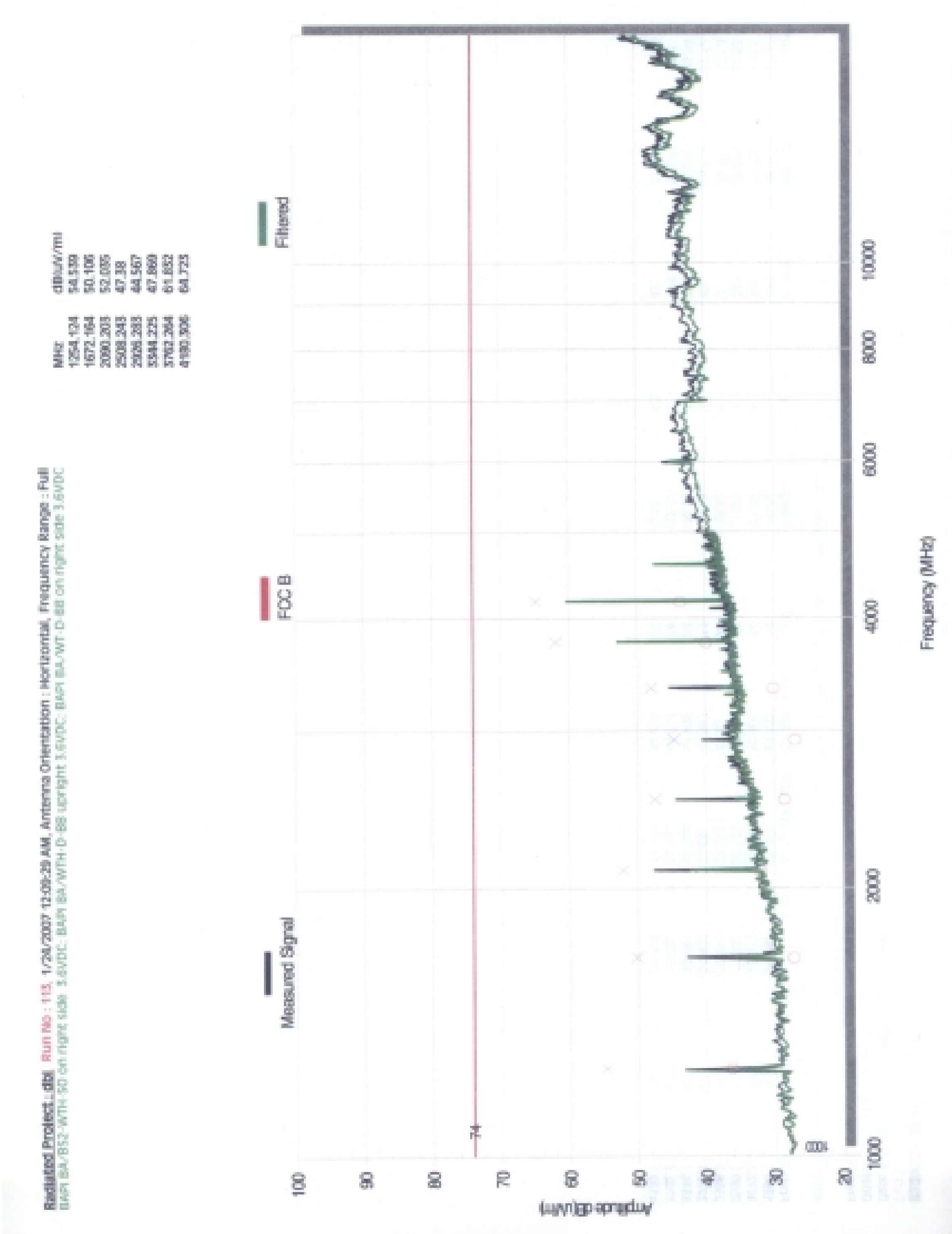
John R. Barnes, PRESIDENT dBi Corporation


Measured Signal
FCC B
Filtered
Frequency (MHz)
Amplitude dB(uV/m)



Radiated Project : dBi Run No : 72, 1/20/2007 12:37:45 AM, Antenna Orientation : Horizontal, Frequency Range : Full
BAPI BA/WT-D-BB S/N 61150004, BAPI BA/WTH-D-BB S/N 70144004, & BAPI BA/BS2-WTH-50 S/N 70151000
3.6VDC
MHz dBiuV/m
33.016 12.933
46.115 10.177
57.24 1.796
67.019 24.434
72.007 6.185
82.567 11.333
149.289 8.562
267.423 10.597
418.004 60.712
836.008 48.896
Measured Signal
FCC B
Filtered
Amplitude dB(uV/m)
Frequency (MHz)
100
54
46
43.5
40

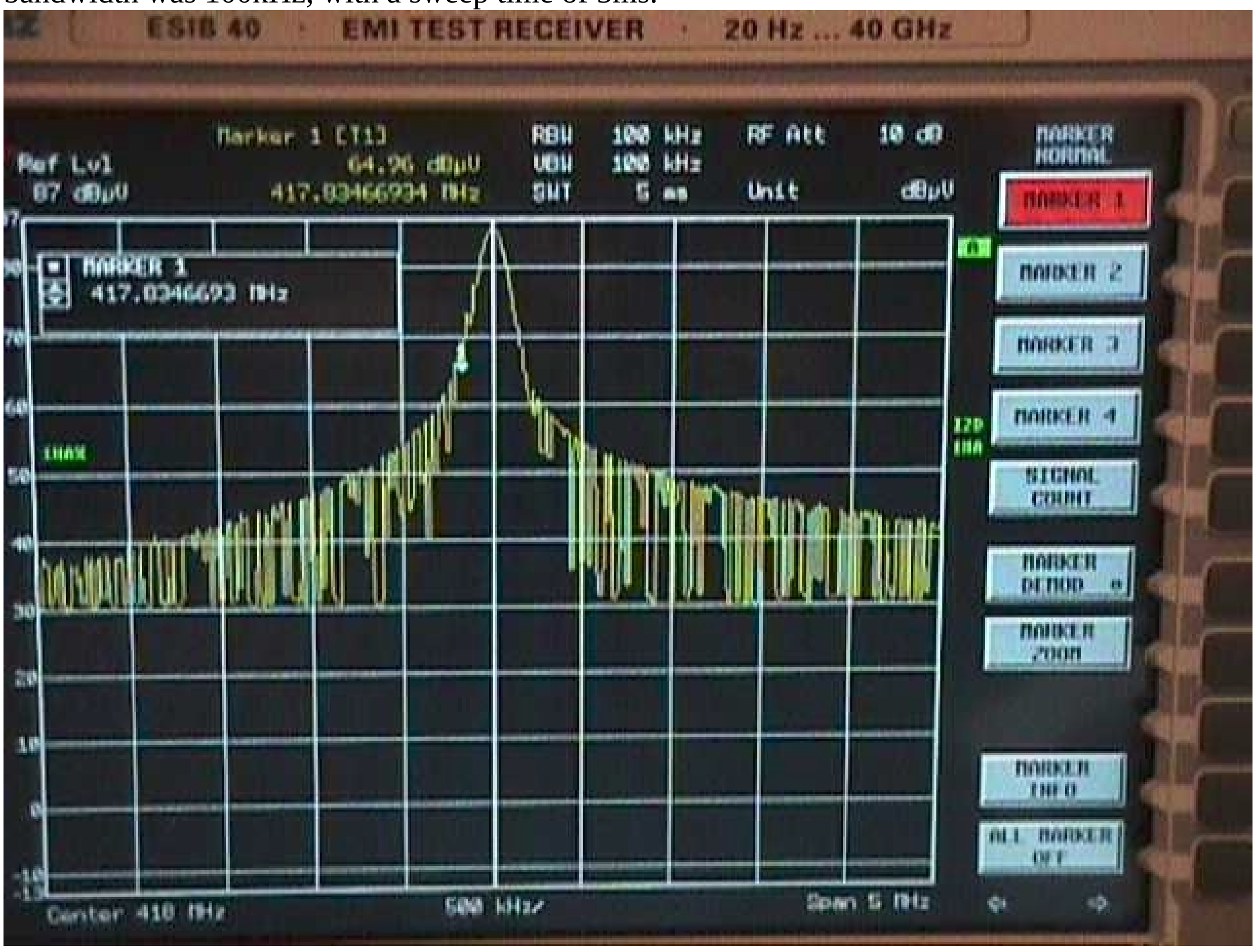

Measured Signal
FCC B
Filtered
Frequency (MHz)
Amplitude dB(uV/m)


Measured Signal
FCC B
Filtered
Frequency (MHz)
Amplitude dB(uV/m)

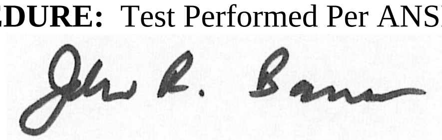
Transmitted Bandwidth Data (BA/WT-D-BB)

Appliance/Product: temperature sensor
Model/Type Number: BA/WT-D-BB
FCC ID: xxxxxxxxxx
Rating: 3.6Vdc (Lithium batteries)
Serial Number: 61150004

Test Results: The 20dB transmitted bandwidth of the BA/WT-D-BB is 340.7kHz (417.8347MHz to 418.1754MHz), 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 500kHz, and each vertical division is 10dB. The RBW bandwidth was 100kHz, and the VBW bandwidth was 100kHz, with a sweep time of 5ms.



PROCEDURE: Test Performed Per ANSI 63.4 – 2003.

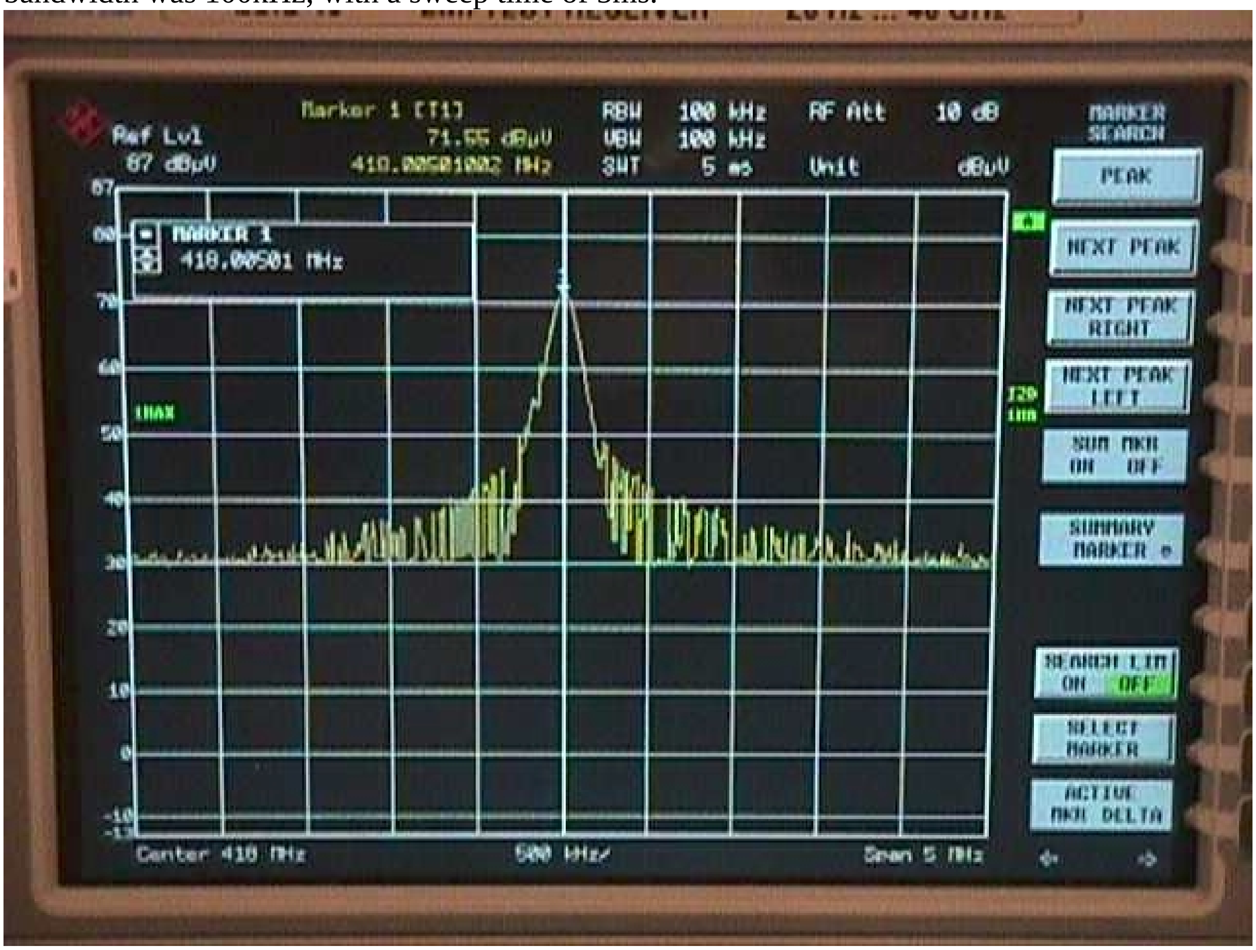


Signed______________________________________**Date** __March 8, 2007__
John R. Barnes, PRESIDENT dBi Corporation

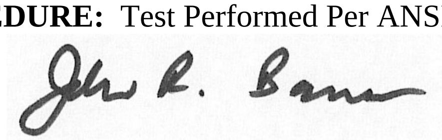
Transmitted Bandwidth Data (BA/WTH-D-BB)

Appliance/Product: temperature/humidity sensor
Model/Type Number: BA/WTH-D-BB
FCC ID: xxxxxxxxxx
Rating: 3.6Vdc (Lithium batteries)
Serial Number: 70144004

Test Results: The 20dB transmitted bandwidth of the BA/WT-D-BB is 380.8kHz (417.8046MHz to 418.1854MHz), 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 500kHz, and each vertical division is 10dB. The RBW bandwidth was 100kHz, and the VBW bandwidth was 100kHz, with a sweep time of 5ms.



PROCEDURE: Test Performed Per ANSI 63.4 – 2003.



Signed______________________________________**Date** __March 8, 2007__
John R. Barnes, PRESIDENT dBi Corporation

Transmitted Bandwidth Data (BA/BS2-WTH-SO)

Appliance/Product: temperature/humidity sensor
Model/Type Number: BA/BS2-WTH-SO
FCC ID: xxxxxxxxxx
Rating: 3.6Vdc (Lithium batteries)
Serial Number: 70151000

Test Results: The 20dB transmitted bandwidth of the BA/BS2-WTH-SO is 370.7kHz (417.8447MHz to 418.2154MHz), 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 500kHz, and each vertical division is 10dB. The RBW bandwidth was 100kHz, and the VBW bandwidth was 100kHz, with a sweep time of 5ms.

PROCEDURE: Test Performed Per ANSI 63.4 – 2003.

Signed______________________________________**Date** March 8, 2007

John R. Barnes, PRESIDENT dBi Corporation

Conducted Emissions 150 kHz-30 MHz (Internal Batteries)

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

Appliance/Product: temperature sensor
Model/Type Number: BA/WT-D-BB
FCC ID: xxxxxxxxxx
Rating: 3.6Vdc (Lithium batteries)
Serial Number: 61150004

Appliance/Product: temperature/humidity sensor
Model/Type Number: BA/WTH-D-BB
FCC ID: xxxxxxxxxx
Rating: 3.6Vdc (Lithium batteries)
Serial Number: 70144004

Appliance/Product: temperature/humidity sensor
Model/Type Number: BA/BS2-WTH-SO
FCC ID: xxxxxxxxxx
Rating: 3.6Vdc (Lithium batteries)
Serial Number: 70151000

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: These units get power from internal batteries and have no connection to AC power lines. Therefore they meet the Class B conducted interference requirements of FCC Part 15 without testing.

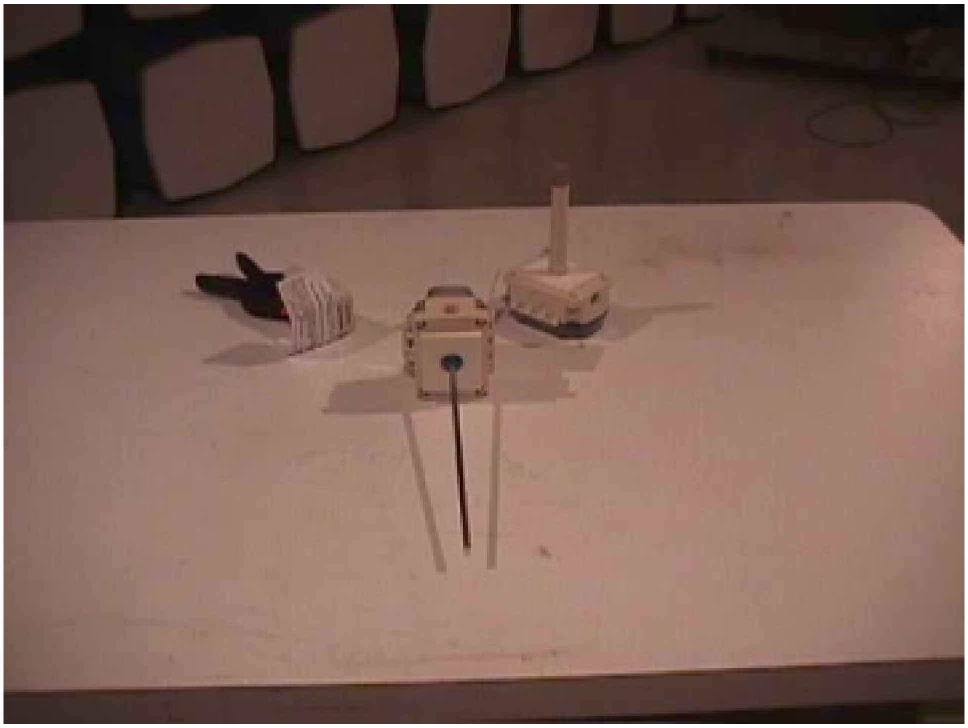
SIGNED________________________________**DATE** __March 8, 2007__
John R. Barnes, PRESIDENT dBi Corp.

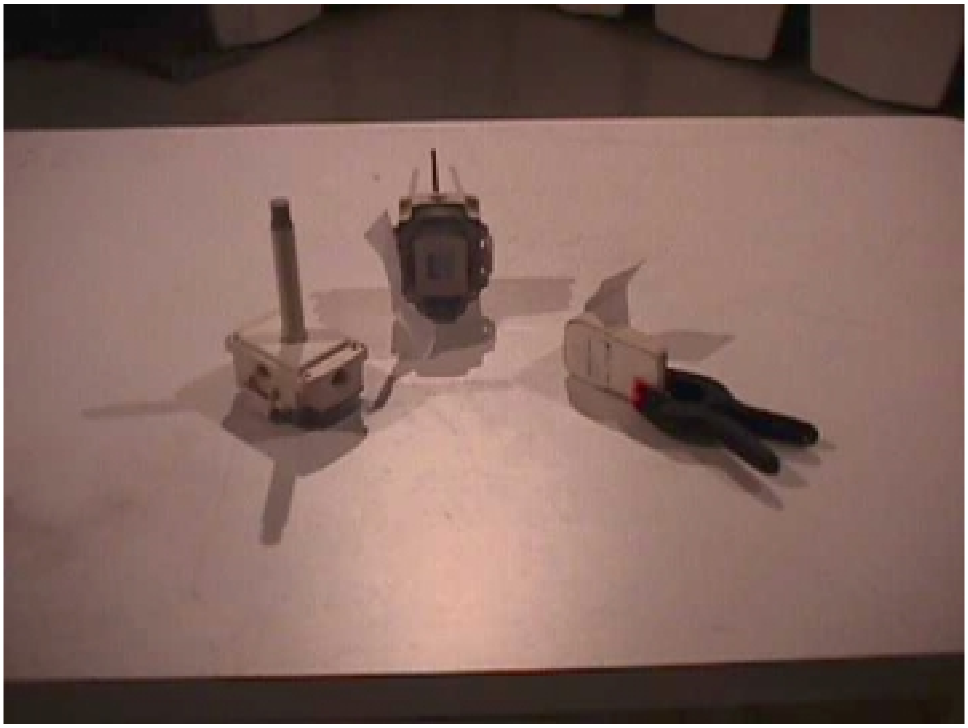
TESTING AND MEASURING EQUIPMENT USED AT LEXMARK

Radiated Interference and Bandwidth Measurements 30-4,180MHz:

Rohde & Schwarz EMI Test Receiver #0700	ESIB40, S/N 100148 (Cal date: 5/5/05, Cal due date: 5/5/07)
Schaffner-Chase BI-Log Antenna 30 to 1000 MHz #0507	CBL6111C, S/N 2460 (Cal date: 10/2/06, Cal due date: 10/2/08)
ARA Horn Antenna, 1GHz to 18GHz #0389	DRG-118/A, S/N 1091 (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 RADIATED-EMISSIONS & BANDWIDTH TEST CONFIGURATION
BA/WT-D-BB, BA/WTH-D-BB, & BA/BS2-WTH-SO
5m SEMIANECHOIC CHAMBER
LEXMARK INTERNATIONAL, LEXINGTON KY.