dBi Corporation

FCC/IC Certification Test Report
BAPI BA/WFP-S and BAPI BA/WFP-B Wireless Food Probes
Report Number 10dBi002a
April 30, 2010
(this test report replaces test report 10dBi002, dated January 15, 2010, in its entirety)

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/WFB-S and BA/WFP-B Wireless Food Probes 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 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. BAPI is responsibility for ensuring that the production models of these products comply with the FCC and CE Marking requirements, and continue to comply throughout their manufacturing life. BAPI should check any changes to the products that could change their interference profile.

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 19th day of September 2008.

President
For the Accreditation Council
Certificate Number 1985.01
Valid to: September 30, 2010

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

ELECTRICAL (EMC)

Valid To: September 30, 2010 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 (30 MHz to 18 GHz)	FCC 47 CFR Part 15 (using C63.4-2003); ICES-003 (2004); CAN/CSA CISPR 22 (2002); CISPR 22 (1997, 2003, 2005); EN 55022 (1998, 2006); AS/NZS CISPR 22 (2002, 2004, 2006); CNS 13438-1997; VCCI (2006, 2007, 2008); IEC 61000-6-3 (2006); EN 61000-6-3 (2001, 2007); AS/NZS 4251.1 (1999); IEC 61000-6-4 (2006); EN 61000-6-4 (2001, 2007); AS/NZS 4251.2 (1999); EN 55013 (2001); AS/NZS CISPR 13 (2004)
Conducted Emissions	FCC 47 CFR Part 15 (using C63.4-2003); ICES-003 (2004); CAN/CSA CISPR 22 (2002); CISPR 22 (1997, 2003, 2005); EN 55022 (1998, 2006); AS/NZS CISPR 22 (2002, 2004, 2006); CNS 13438-1997; VCCI (2006, 2007, 2008); IEC 61000-6-3 (2006); EN 61000-6-3 (2001, 2007); AS/NZS 4251.1 (1999); IEC 61000-6-4 (2006); EN 61000-6-4 (2001, 2007); AS/NZS 4251.2 (1999); EN 55013 (2001); AS/NZS CISPR 13 (2004)

Peter Unger

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

American Association for Laboratory Accreditation

Test Technology	Test Method(s)
Disturbance Power	EN 55013 (2001); AS/NZS CISPR 13 (2004)
Harmonics	IEC 61000-3-2 (2001, 2005); EN 61000-3-2 (2000, 2006)
Flicker	IEC 61000-3-3 (1994, 2002); EN 61000-3-3 (1995)
Electrostatic Discharge	IEC 61000-4-2 (1995); EN 61000-4-2 (1995); AS/NZS 61000.4.2 (2002)
Radiated Immunity (80 MHz to 150MHz, 6V/m; 150 MHz to 1 GHz, 10V/m; 1GHz to 2GHz, 3V/m; 2GHz to 3GHz, 1V/m)	IEC 61000-4-3 (1995, 2002); EN 61000-4-3 (1996); AS/NZS 61000.4.3 (2006)
Electrical Fast Transient/Burst	IEC 61000-4-4 (1995); EN 61000-4-4 (1995); AS/NZS 61000.4.4 (2006)
Surge Immunity	IEC 61000-4-5 (1995); EN 61000-4-5 (1995); AS/NZS 61000.4.5 (2006)
Conducted Immunity	IEC 61000-4-6 (1996); EN 61000-4-6 (1996); AS/NZS 61000.4.6 (2006)
Magnetic Field Immunity	IEC 61000-4-8 (1993, 2001); EN 61000-4-8 (1993); AS/NZS 61000.4.8 (2002)
Voltage Dip Immunity	IEC 61000-4-11 (1994, 2001); EN 61000-4-11 (1994, 2004); AS/NZS 61000.4.11 (2005)
ITE Product Family	CISPR 24 (1997); EN 55024 (1998)
Generic Devices for Residential, Commercial, and Light Industrial Use	IEC 61000-6-1 (2005); EN 61000-6-1 (2001, 2007)
Generic Devices for Industrial Use	IEC 61000-6-2 (2005); EN 61000-6-2 (2001, 2005)

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Test Technology	Test Method(s)
Electrical Equipment for Measurement, Control, and Laboratory Use	IEC 61326 (2002); IEC 61326-1 (2005); EN 61326 (1997); EN 61326-1 (2006)
Sound and Television Broadcast Receivers and Associated Equipment	EN 55013 (2001); AS/NZS CISPR 13 (2004)

Types of products, materials, and/or industry that the laboratory tests:
-Information Technology Equipment (ITE) – 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;
-Sound and Television Broadcast Receivers and Associated Equipment

[1]Note: Testing is performed using the equipment and facility at:
Lexmark International EMC Laboratory
740 New Circle Road NW
Lexington, KY 40511-1876
(A2LA Accreditaiton Certificate 0872.01)

(A2LA Cert. No. 1985.01) 9/19/08

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ADMINISTRATIVE DATA

Manufacturer:

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

Appliance/Product: Wireless Food Probe
Model/Type Number: BA/WFP-S
FCC ID: T4FSM061025
Rating: 3.6VDC (Lithium battery)

Appliance/Product: Wireless Food Probe
Model/Type Number: BA/WFP-B
FCC ID: T4FSM061025
Rating: 3.6VDC (Lithium battery)

Power Line Filters and RF Suppression Components: see attached sheets
Measurement Equipment used: see attached sheets.
Measurements According to, and Sample Units Comply with:

FCC 47 CFR Part 15-2008 for the US, using ANSI C63.4:2003, with >= 0.82dB Margin for Radiated Emissions.
RSS-210 Issue 7 (June 2007) for Canada, using RSS-Gen Issue 2 (June 2007), with >= 0.82dB margin for Radiated Emissions

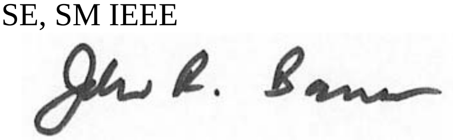
Report Prepared By: John R. Barnes KS4GL, PE, NCE, NCT, ESDC Eng, ESDC Tech, PSE, SM IEEE

Testing Performed by:

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

on January 12-14, 2010
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



SIGNED________________________________**DATE**__April 30, 2010__
John R. Barnes, PRESIDENT dBi Corp.

INFORMATION RELATING TO PRODUCT RF INTERFERENCE

Appliance/Product: Wireless Food Probe
Model/Type Number: BA/WFP-S
FCC ID: T4FSM061025
Rating: 3.6VDC (Lithium battery)

Power Line Filters: none.

RF Suppression Components: none

Clock Frequencies: 8MHz and 418MHz

External Cables: none.

Electronic Printed Circuit Boards:

Transmitter PCB P/N 17545

Size of Product: 33mm diameter x 152mm high
Weight of Product: 0.1kg
Operating Environment: Indoors

Test Samples Received: January 12, 2010

Overall Test Plan:

These units shall be tested as tabletop equipment. Equipment that normally is stacked, may be stacked in any convenient order. Tests may be performed in any order, except that that the last two tests shall be (if required):

1. Electrostatic Discharge (ESD).
2. Surge Immunity.

Composition of Equipment-Under-Test (EUT): Standard

Assembly of EUT (Options): Standard

Input/Output Ports: None

Auxiliary Equipment (AE): None

Cabling and grounding: No cables. No intentional grounding.

Test Configuration: Standalone unit, orientation to be determined during testing.

Operating Mode:

Measuring air temperature and transmitting data once per second.

Symptoms of Malfunction for Immunity Tests:

Stops transmitting, or transmits incorrect temperature.

Performance Criteria for Immunity Tests:

1 or A = normal performance within the specification limits.
2 or B = temporary degradation, or temporary loss of function or performance during the test, which is self-recoverable.
3 or C = temporary degradation, or temporary loss of function or performance during the test, which requires operator intervention.
4 or D = loss of data, degradation, or loss of function or performance during the test, which is not recoverable due to damage to the hardware or software of the EUT.

INFORMATION RELATING TO PRODUCT RF INTERFERENCE

Appliance/Product: Wireless Food Probe
Model/Type Number: BA/WFP-B
FCC ID: T4FSM061025
Rating: 3.6VDC (Lithium battery)

Power Line Filters: none.

RF Suppression Components: none

Clock Frequencies: 8MHz and 418MHz

External Cables: none.

Electronic Printed Circuit Boards:
Transmitter PCB P/N 17545

Size of Product: 33mm diameter x 152mm high
Weight of Product: 0.1kg
Operating Environment: Indoors

Test Samples Received: January 12, 2010

Overall Test Plan:

These units shall be tested as tabletop equipment. Equipment that normally is stacked, may be stacked in any convenient order. Tests may be performed in any order, except that that the last two tests shall be (if required):

3. Electrostatic Discharge (ESD).
4. Surge Immunity.

Composition of Equipment-Under-Test (EUT): Standard

Assembly of EUT (Options): Standard

Input/Output Ports: None

Auxiliary Equipment (AE): None

Cabling and grounding: No cables. No intentional grounding.

Test Configuration: Standalone unit, orientation to be determined during testing.

Operating Mode:

Measuring air temperature and transmitting data once per second.

Symptoms of Malfunction for Immunity Tests:

Stops transmitting, or transmits incorrect temperature.

Performance Criteria for Immunity Tests:

1 or A = normal performance within the specification limits.

2 or B = temporary degradation, or temporary loss of function or performance during the test, which is self-recoverable.

3 or C = temporary degradation, or temporary loss of function or performance during the test, which requires operator intervention.

4 or D = loss of data, degradation, or loss of function or performance during the test, which is not recoverable due to damage to the hardware or software of the EUT.

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

Radiated Emission Standards:

FCC 47 CFR Part 15-2008, using ANSI C63.4-2003; section 15.231(e).
RSS-210 Issue 7 (June 2007), using RSS-Gen Issue 2 (June 2007), section A1.1.5

Appliance/Product: Wireless Food Probe
Model/Type Number: BA/WFP-S
FCC ID: T4FSM061025
Rating: 3.6VDC (Lithium battery)
Serial Number: 18587 (80354020)

Appliance/Product: Wireless Food Probe
Model/Type Number: BA/WFP-B
FCC ID: T4FSM061025
Rating: 3.6VDC (Lithium battery)
Serial Number: 18586 (80354070)

Host and Other Peripherals: None

Name of Test: Radiated Interference
Test Procedure: ANSI C63.4-2003, RSS-Gen Issue 2 (June 2007)
Test Location: 5m semianechoic chamber
Test Distance: 3m
Test Instrumentation: See attached sheets

Notes: Tests performed at 23.1°C, 40.1% relative humidity, and 98.70kPa atmospheric pressure in 5m chamber. Before starting any approval tests, we do Total Cals on all of the receivers, then do a Radiated Checkout of the 10m Chamber (antenna, cables, and preamp) if one has not been performed within the last week The expanded uncertainty (k=2 for 95% probability) is +/-3.40dB for electric and magnetic fields below 30MHz; +/-3.26dB for electric fields from 30MHz to 1000MHz; and +/-3.84dB for electric fields from 1GHz to
` 18GHz.

The equipment-under-test (EUT) and auxiliary equipment (AE) are set up in the chamber according to the test plan and the test procedures. In general, we prefer to put the AE on the table with the EUT. Noisy AE, such as a Class A host computer or Class A router being used to test a Class B product, may be installed in the pit under the turntable or in the control room, cabled to the EUT through the hole in the middle of the turntable. In this case we put ferrites on the cable(s) underneath the turntable, to keep AE-induced and ambient noise from entering the chamber. Long input/output cables are serpentined to keep them >40cm from the floor.

If standard cables are available for an EUT's input/output port(s), we prefer to use them. If cables are custom-made for each installation of an EUT, we use cables that are at least

1m long. At least one port of each type on the EUT is connected to AE with a cable— except that we do not put cables on ports that are used only for manufacturing or servicing. If the EUT has multiple ports of a certain type, we add cables (that may go to AE, terminate in dummy loads, or be left unterminated) until adding a cable makes less than a 2dB increase in the emissions. The additional cables needed may be determined by testing this EUT, or by prior experience with these same input/output ports on previous products. If an EUT has several ports with identical functions that are mutually-exclusive— only one of them *can* be used in a particular installation of the EUT— we try to run the test with all of the cables attached, but only the noisiest port providing data to the EUT. If this configuration puts us over the limits, we experiment with one port at a time cabled to AE and providing data, with the other ports left unconnected. Then we make the official measurements using the noisiest port that will typically be used by users.

We set up the EUT, AE, input/output cables, and line cords/power cables in the configuration and typical operating mode that we think will maximize emissions. This may require some experimenting to determine for sure, but is usually the configuration/operating mode that has as many subsystems of the EUT active simultaneously as possible, at their highest resolution, and operating at maximum speed.

We run an initial scan with the antenna in vertical polarization at heights of 1m, 2.5m, and 4m. We measure the 3-5 frequencies whose Radiated Emissions appear to be highest with respect to the test limits. Then we run an initial scan with the antenna in horizontal polarization the same way. For a small intentional radiator, we will perform three sets of initial scans (6 total), with the EUT sitting on its bottom or top, back or front, and left-side or right-side, to determine which orientation of the EUT maximizes emissions.

At any time during the approval testing, if a measurement is above or close to a limit, we try to determine the cause of the problem, and fix it. Fixes to the EUT will be documented in the test notes and test report. If a piece of AE is the source of the noise, we may try a replacement (such as another hub/router, or using a crossover cable in place of a hub), or move the AE outside of the chamber. If AE is the source of the noise, and we can't resolve the problem any other way, we will measure these frequencies with the AE turned on and again with it turned off. We then note in the test notes, test plots, and test report that the excessive emissions are due to ___________ piece of AE.

We examine the initial plots to see which frequency at which antenna orientation has the minimum margin versus the test limits. If the minimum margin is >6dB, we treat the cables as already being maximized, and immediately perform the official tests. Otherwise (the usual case), we return to the antenna orientation, frequency, azimuth, and antenna height with the minimum margin. We turn on the video projector in the chamber, or turn on the audio feedback, and take a baseline reading while we are in the chamber, before we touch anything. Then we move cables and line cords, trying to increase the emissions at this frequency, until any further changes have no effect, or reduce the emissions. This becomes our maximized cable configuration for the official tests, which will be photographed and included in the test report. For tests above 1GHz, we use the same cable configuration as maximized the emissions below 1GHz.

We now perform the official Radiated Emissions measurements. For each polarization of the antenna (vertical and horizontal), we spin the turntable at least one full turn each with the antenna at 1m. 2.5m. and 4m height. We choose at least 10 frequencies at each polarization that look "interesting". At each of these frequencies we do a narrowband scan to find the frequency with the least margin against the test limits. We quasipeak (peak and average above 1GHz) this specific frequency, turning the turntable 360° with the antenna at the height that we think will maximize the emissions (usually 1m antenna height for vertical polarization, and 4m for horizontal polarization). After this full turn, we turn the turntable back to the azimuth (angle) with the highest emissions so far, and sit there long enough for the EUT to go through a full cycle. Then we vary the antenna height from 1m to 4m, to see if another antenna height gives us higher emissions. If so, we return to that antenna height, and turn the turntable again to find the maximum emissions. This becomes our official measurement. We repeat this process for all of the frequencies of interest in both antenna polarizations, at all AC input voltages/frequencies of concern, and for all frequency bands specified by the test standards.

For intentional radiators to be approved to EU and AUS/NZ standards, the fundamental and harmonics in the 30-1000MHz range should also be quasipeak measured with the EUT at 1.0m and 1.5m heights, at 10m distance.

For Radiated Emission Measurements below 30MHz we use a calibrated EMI receiver connected to a shielded-loop receiving antenna. We maximize power and modulation, move cables, and rotate both the EUT and the receiving antenna to maximize emissions. We set the receiver to:

- 200 Hz bandwidth for 9kHz to 150kHz measurements.
- 9kHz bandwidth for 150kHz to 30MHz measurements
- 120kHz bandwidth for 30MHz to 1GHz measurements.

Otherwise, there is very little agreement between nations, between overlapping standards/ regulations within a nation, between versions of a standard, or even *inside one standard,* for:

- Electric field strength, magnetic field strength, RF carrier current, effective radiated power (ERP), or equivalent isotropic radiated power (EIRP).
- 15dB, 20dB, or 33dB bandwidth.
- Of the fundamental, harmonics, out-of –band emissions, or spurious emissions,
- Measured with peak, quasipeak, or average detectors.
- Expressed in uV/m, dBuV/m, dBuA/m, or Watts
- Measured over a ground plane or not,
- At 300m, 30m, 10m, or 3m distance,
- Under 30MHz, extrapolated to other distances by using the square of the ratio of the distances (40dB/decade distance), by measurements at two distances on one radial from the EUT, or by using a frequency-dependent conversion factor,
- With tabletop EUT's on an 0.8m, 1.0m, or 1.5m high support,
- With floor-standing EUT's on a <= 12mm-thick insulator.

- With the center, or the bottom, of the loop antenna at 1m height,
- Over 0°C to 35°C, 0°C to 40°C, 0°C to 55°C, -10°C to 55°C, –20°C to 50°C, or -20°C to +55°C temperature range,
- Over nominal supply voltage +/-10%, nominal–10% to nominal+30%, nominal +/-15%, with a freshly-charged battery, or with a new battery.
- At temperature extremes, over a temperature range, or at temperature *and* supply voltage extremes.
- At 0 minutes, 1 minute, 2 minutes, 5 minutes, 10 minutes, 15 minutes, or 30 minutes after startup at a specific temperature/voltage.

Therefore, when running Radiated Emission tests on intentional radiators operating under 30MHz, we record the temperature, humidity, and atmospheric pressure at the test site as a baseline value for temperature/supply voltage measurements. If the EUT is AC powered, we test it at nominal, low, and high input voltage for each distance/EUT height/loop-antenna height/mode. We check emissions at the fundamental frequency, and for any harmonics (up through the 10^{th} harmonic) that fall into the frequency range being tested (i.e 9kHz to 30MHz, 30MHz to 1000MHz). For each test point (frequency, distance, EUT height, loop antenna height) we record the peak, quasipeak, and average values in whatever units the EMI receiver provides. With the EMI receiver set to a 1-second measurement time (so we have long enough to note the full reading), we observe the signal level for at least 10 seconds (>= 10 samples) with each detector, and record the highest level seen during this interval.

For the test report we translate these values into dBuV/m, dBuA/m, uV/m, and uA/m using the equations (or their inverses):

- Electric field strengh in uV/m = 377 ohms * magnetic field strength in uA/m.
- Electric field strength in dBuV/m = 20 * log (electric field strength in uV/m).
- Magnetic field strength in dBuA/m = 20 * log (magnetic field strngth in uA/m)

Extrapolation to other measurement distances, or conversion to power in Watts, is done using the formulas in the specific standards,

The loop antenna is mounted on a tripod stand that lets us set its height, and turn the loop for the maximum signal pickup. This is typically with the plane of the loop perpendicular to the line-of-sight to the EUT. For an EUT with the antenna mounted on its front/back/ left/right, the maximum signal pickup will usually be with the EUT's antenna pointed at the loop antenna..

To estimate emissions at temperatures other than those at which the Chamber/OATS test were run, we put the EUT in a thermal chamber. We attach a magnetic field (H-field) probe to the antenna of the EUT using rubber bands, tape, or some other means to keep it in a fixed position with respect to the EUT. A coaxial cable, running through a port in the side/back of the thermal chamber, connects the H-field probe to an EMI receiver outside the chamber. We do a TOTAL CAL of the EMI receiver before starting testing. We put the EUT in the same mode, with the same supply voltage, and at the same temperature, at which the reference Chamber/OATS tests were run. After letting the temperature of the EUT stabilize, we measure the EUT's output as our baseline measurement. Then we vary the temperature, supply voltage, time from power-up, etc., as needed to get the variations due to temperature, supply voltage, and whatever else is specified by the standard(s).

The US and Canada permit these measurements to be made with a groundplane (in the 10m or 5m Chamber) or without a groundplane (next to the open air test site (OATS)). A tabletop EUT sits on an 0.8m high table, with the center of the loop antenna 1.0m high and 3m or 10m from the EUT. We use inverse square of the ratio of distances (-40dB/decade distance) to correct for electric and magnetic fields at other distances.(FCC 47 CFR Part 15 15.31(f)(1)) For 9-90kHz and 110-490kHz we use average and peak measurements, with the peak limit 20dB above the average limit (FCC 47 CFR Part 15 15.35(b)), otherwise we use quasipeak measurements. The loop antenna is the most sensitive when the coil is perpendicular to the line-of-sight. Record the temperature, humidity, and atmospheric pressure, as the baseline for temperature-chamber tests. Measure the fundamental and all of the harmonics (up through the 10^{th}) that fall into the frequency range 9kHz-30MHz..

For Europe, Australia, and New Zealand, these measurements must be made without a groundplane, at the open air test site (OATS). A tabletop EUT will be on a 1.0m or 1.5m high support (use the mag field table, and add boxes or reams of paper to get the desired height). Set the bottom of the loop antenna 1.0m high, 10m away.from the EUT. Make quasipeak measurements. The loop antenna is the most sensitive when the coil is perpendicular to the line-of-sight. Record the temperature, humidity, and atmospheric pressure, as the baseline for temperature-chamber tests. . Measure the fundamental and all of the harmonics (up through the 10^{th}) that fall into the frequency range 9kHz-30MHz..

Noise Floor measurements in the 10m Chamber are made with the door from the 10m Chamber to the control room open, and all other doors to the 10m Chamber, control room, and 5m Chamber closed. Everything is connected and placed for official measurements, but the EUT is powered off.

Noise Floor measurements at the OATS are made with everything connected and placed for official measurements, but with the EUT powered off (unplugged from AC power, or batteries removed).

For intentional radiators that operate under 30MHz, we consider each of the following tests:

Test Name	**Applies to xxxxHz xxxx**	**Status**
Power-line conducted emissions		
Radiated emissions		
Transmitter spectrum mask		
Antenna port conducted signals		
Carrier frequency stability		
Occupied bandwidth		
Output power		
Power spectral density		
In-situ radiated emissions		
Cordless phone security code		
Cordless phone frequency pairing		
Input power		
Periodic operation		
Average value of pulsed emissions		
Compliance with periodic emissions		
Frequency hopping		
Millimeter wave device		
Transmitter etiquette		
UWB device		
Duty cycle		
Operating frequency		
Modulation bandwidth		
Out-of-band transmissions		
Spurious transmissions		
Receiver adjacent channel sensitivity		
Receiver blocking/desensitization		
Receiver spurious emissions		

In the tables below, “Cable Correction Factor dB” covers everything in the standard signal chain between the antenna and the EMI receiver(s). For Radiated Emission measurements with a:

- Loop antenna, below 30MHz, the standard signal chain consists of just the signal cable between the antenna and the EMI receiver. The EMI receiver gets the antenna identifier via the control cable, which also identifies the signal cable and its length, and thus the cable losses.
- Bilog antenna, for 30 to 1000MHz, the standard signal chain consists of a coaxial cable with ferrites, a preamplifier under the chamber floor, coaxial cable(s) to the control station, a signal splitter, and short coaxial cables to two EMI receivers.
- Horn antenna, above 1GHz, the standard signal chain consists of a preamplifier next to the antenna, and coaxial cable(s) to an EMI receiver.

For Radiated Emission measurements above 30MHz we use a low-noise preamplifier mounted as close as possible to the antenna to:

1. Lower the noise floor.
2. Boost the signal level.
   AND THUS
3. Increase the signal-to-noise ratio (SNR).

When calibrating the chamber, we use a vector network analyzer (VNA) to measure the total power loss/gain from the connector going to the antenna to the connector(s) going to the EMI receiver(s). This power loss/gain is our Cable Correction Factor.

Putting two EMI receivers in parallel for 30-1000MHz measurements has a number of benefits:

1. For wideband scans, one EMI receiver monitors 30-500MHz while the second EMI receiver monitors 500-1000MHz, giving us < 1MHz-wide.frequency bins over the entire 970MHz span.
2. While making quasipeak/average/peak measurements with one EMI receiver, we can simultaneously watch the 5MHz span around this frequency to see just what the equipment-under-test (EUT) and auxiliary equipment (AE) are doing. This can be extremely useful when the noise level suddenly jumps up, to determine if a clock/ strobe turns on, a switching regulator turns on or changes mode, data transfers start/ stop, or whatever else may be causing the noise change.
3. We can simultaneously monitor two different frequency bands-- in close detail-- to see if noise on them has the same/different cause(s).
4. We can (manually) put one EMI Receiver into Spectrum Analyzer mode with 0-Hz span. This effectively turns it into a oscilloscope for one frequency, letting us see the waveform(s) that are causing us problems while we observe the noise level/noise envelope with the second receiver.
5. Any other crazy experiments that we may come up with while chasing down noise problems, where seeing time- and frequency-domain data, or two different types of frequency-domain data, can help us identify the noise source(s) and antenna(s).

When testing intentional radiators, we may need to add attenuators or filters between the antenna and the preamplifier. Strong signals can overload a preamplifier, causing signal compression or making it generate spurious harmonics. Or a strong signal at one frequency can desensitize the preamplifier to noise signals at other frequencies. These attenuators/filters must be calibrated, and we include their losses in our calculations when we crunch the Radiated Emissions data.

Transmitting at 1 second intervals to speed up testing. This was a special code spin for EMC testing. The standard code transmits once every 10 to 600 seconds.

Based on our experiences testing previous FCC Part 15.231(e) products, we put a calibrated 20dB attenuator right after the bi-con antenna to prevent signal compression in the preamp/receiver chain. for measurements from 30-1000MHz. We added its loss (20.194dB at 418MHz, 20.15dB at 836MHz) to the field strengths measured by the receiver in this band. We used a different antenna and preamp for measurements above 1GHz. The FCC Part 15.231(e) limits above 1GHz are lower than the FCC Class A limits above 1GHz, 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 836MHz 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 antenna elevation for the highest QP emissions). If the receiver shows an overload, increase input attenuation by 10dB, then redo the measurement.
2. Repeat step 1 with the EUT on its back or front.
3. Repeat step 1 with the EUT on its right or left 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 antenna 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 the receiver showed an overload, or we still suspected signal compression, we increased the input attenuation 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 true field strength.
9. Repeat steps 5 to 8 with the bi-con antenna horizontal.

For measurements from:

- 9kHz to 150kHz we use a 200Hz 6dB resolution bandwidth (RBW).
- 150kHz to 30MHz we use a 9kHz 6dB RBW.
- 30MHz to 1000MHz (1GHz) we use a 120kHz 6dB RBW.
- Above 1GHz we use a 1MHz 6dB RBW.

All quasipeak/average/peak measurements are 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).

These sensors transmit a 14-16ms data burst, depending on the identification (ID) code. The duty cycle within a data burst is nominally 50%, but can be as high as 66%. Thus the maximum total transmit time is 0.66 * 16ms = 10.56ms within any 100ms time interval.
Averaged over a 100ms interval, the AVE measurement should be at least 20*log(10.56ms/100ms) = -19.53dB 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 this sensor.

As first tested, the fundamental (418MHz) was over the FCC Part 15.231(e) limit. We finally fixed this— without causing other problems— by winding the antenna into a small, tightly-spaced coil, and soldering it to the component-side of the transmitter PCB.

Test Results: With these modifications, Tables 1 through 4, and the Transmitted Bandwidth Data, show that this unit meets the radiated interference requirements of FCC Part 15 Section 15.231(e) and RS-210 Section A1.1.5.

SIGNED________________________________**DATE** _April 30, 2010__
John R. Barnes, PRESIDENT dBi Corp.

Radiated Emissions Data 30-4,180MHz

Appliance/Product: Wireless Food Probe
Model/Type Number: BA/WFP-S
FCC ID: T4FSM061025
Rating: 3.6VDC (Lithium battery)
Serial Number: 18587 (80354020)

Appliance/Product: Wireless Food Probe
Model/Type Number: BA/WFP-B
FCC ID: T4FSM061025
Rating: 3.6VDC (Lithium battery)
Serial Number: 18586 (80354070)

TABLE 1: PEAK EMISSIONS

Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)	Receiver Reading Horiz. dB(uV)	Cable Corr. Factor dB	Antenna Factor dB(/m)	Atten. dB	Rad. Interference Field Strength Vert. dB(uV/m)	Rad. Interference Field Strength Horiz. dB(uV/m)	15.231(e) Peak Limit dB(uV/m)
418.000	73.940	61.210	-19.300	16.200	20.194	91.034	78.304	92.33
836.000	29.115	23.625	-17.835	22.200	20.150	53.630	48.140	72.33
1254.0	46.144	45.265	-27.728	25.092	0.000	43.508	42.629	72.33
1672.0	51.611	40.229	-26.417	26.889	0.000	52.083	40.701	72.33
2090.0	52.871	45.957	-25.847	28.462	0.000	55.486	48.572	72.33
2508.0	46.247	38.944	-25.398	29.214	0.000	50.063	42.760	72.33
2926.0	38.819	33.142	-24.914	29.967	0.000	43.872	38.195	72.33
3344.0	49.233	45.144	-24.263	31.063	0.000	56.033	51.944	72.33
3762.0	41.266	38.444	-23.783	32.233	0.000	49.716	46.894	72.33
4180.0	29.335	31.365	-23.306	33.026	0.000	39.055	41.085	72.33

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

SIGNED________________________________**DATE** April 30, 2010
John R. Barnes, PRESIDENT dBi Corp.

Radiated Emissions Data 30-4,180MHz (cont.)

TABLE 2: QUASIPEAK EMISSIONS

Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)	Receiver Reading Horiz. dB(uV)	Cable Corr. Factor dB	Antenna Factor dB(/m)	Atten. dB	Rad. Interference Field Strength Vert. dB(uV/m)	Rad. Interference Field Strength Horiz. dB(uV/m)	15.231(e) QP Limit dB(uV/m)
418.000	69.450	56.650	-19.300	16.200	20.194	86.544	73.744	
836.000	22.125	16.585	-17.835	22.200	20.150	46.640	41.100	

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

TABLE 3: MEASURED AVERAGE EMISSIONS

Receiver Meas. Freq. MHz	Receiver Reading Vert. dB(uV)	Receiver Reading Horiz. dB(uV)	Cable Corr. Factor dB	Antenna Factor dB(/m)	Atten. dB	Rad. Interference Field Strength Vert. dB(uV/m)	Rad. Interference Field Strength Horiz. dB(uV/m)	15.231(e) AVE Limit dB(uV/m)
418.000	54.090	41.090	-19.300	16.200	20.194	71.184	58.184	72.33
836.000	13.625	10.625	-17.835	22.200	20.150	38.140	35.140	52.33
1254.0	27.050	28.573	-27.728	25.092	0.000	24.414	25.937	52.33
1672.0	31.569	24.540	-26.417	26.889	0.000	32.041	25.012	52.33
2090.0	32.960	29.182	-25.847	28.462	0.000	35.575	31.797	52.33
2508.0	27.306	22.349	-25.398	29.214	0.000	31.122	26.165	52.33
2926.0	21.659	19.098	-24.914	29.967	0.000	26.712	24.151	52.33
3344.0	29.690	26.585	-24.263	31.063	0.000	36.490	33.385	52.33
3762.0	22.607	21.471	-23.783	32.233	0.000	31.057	29.921	52.33
4180.0	15.697	16.475	-23.306	33.026	0.000	25.417	26.195	52.33

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

SIGNED________________________________ **DATE** April 30, 2010

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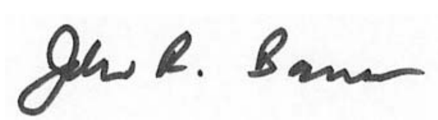
Radiated Emissions Data 30-4,180MHz (cont.)

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)	Atten. dB	Duty-cyc. Corr. Factor dB	Rad. Interfer Field Strength Vert. dB(uV/m)	Rad. Interfer Field Strength Horiz. dB(uV/m)	15.231(e) AVE Limit dB(uV/m)
418.0	73.940	61.210	-19.300	16.200	20.194	-19.527	71.507	58.777	72.33
836.0	29.115	23.625	-17.835	22.200	20.150	-19.527	34.103	28.613	52.33
1254.0	46.144	45.265	-27.728	25.092	0.000	-19.527	23.981	23.102	52.33
1672.0	51.611	40.229	-26.417	26.889	0.000	-19.527	32.556	21.174	52.33
2090.0	52.871	45.957	-25.847	28.462	0.000	-19.527	35.959	29.045	52.33
2508.0	46.247	38.944	-25.398	29.214	0.000	-19.527	30.536	23.233	52.33
2926.0	38.819	33.142	-24.914	29.967	0.000	-19.527	24.345	18.668	52.33
3344.0	49.233	45.144	-24.263	31.063	0.000	-19.527	36.506	32.417	52.33
3762.0	41.266	38.444	-23.783	32.233	0.000	-19.527	30.189	27.367	52.33
4180.0	29.335	31.365	-23.306	33.026	0.000	-19.527	19.528	21.558	52.33

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



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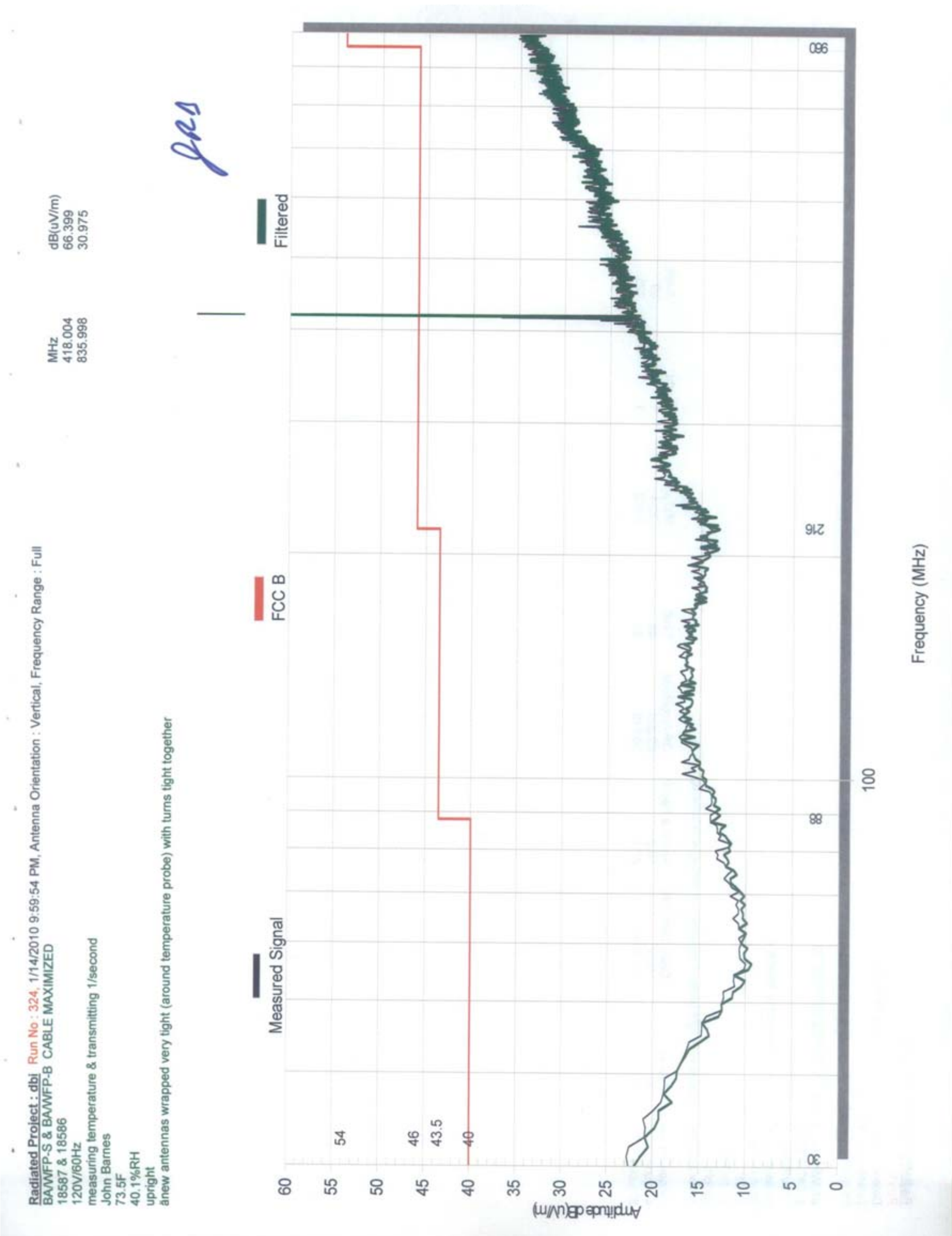
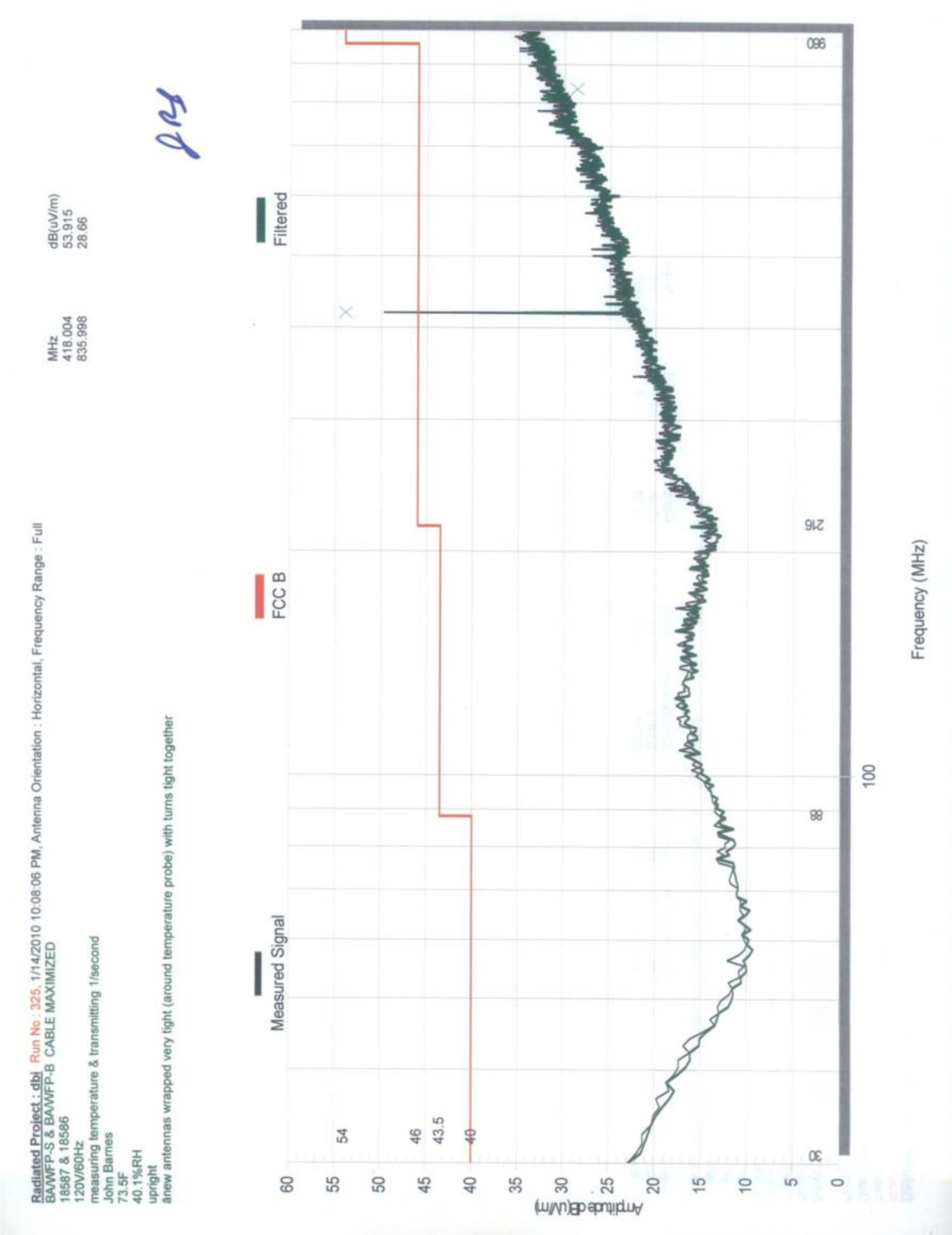
John R. Barnes, PRESIDENT dBi Corporation



Radiated Project : dbi Run No : 324, 1/14/2010 9:59:54 PM, Antenna Orientation : Vertical, Frequency Range : Full
BAWFP-S & BAWFP-B CABLE MAXIMIZED
18587 & 18586
120V/60Hz
measuring temperature & transmitting 1/second
John Barnes
73.5F
40.1%RH
upright
ânew antennas wrapped very tight (around temperature probe) with turns tight together
MHz
418.004
835.998
dB(uV/m)
66.399
30.975
Measured Signal
FCC B
Filtered
54
46
43.5
40
30
88
100
216
960
60
55
50
45
40
35
30
25
20
15
10
5
0
Amplitude dB(uV/m)
Frequency (MHz)

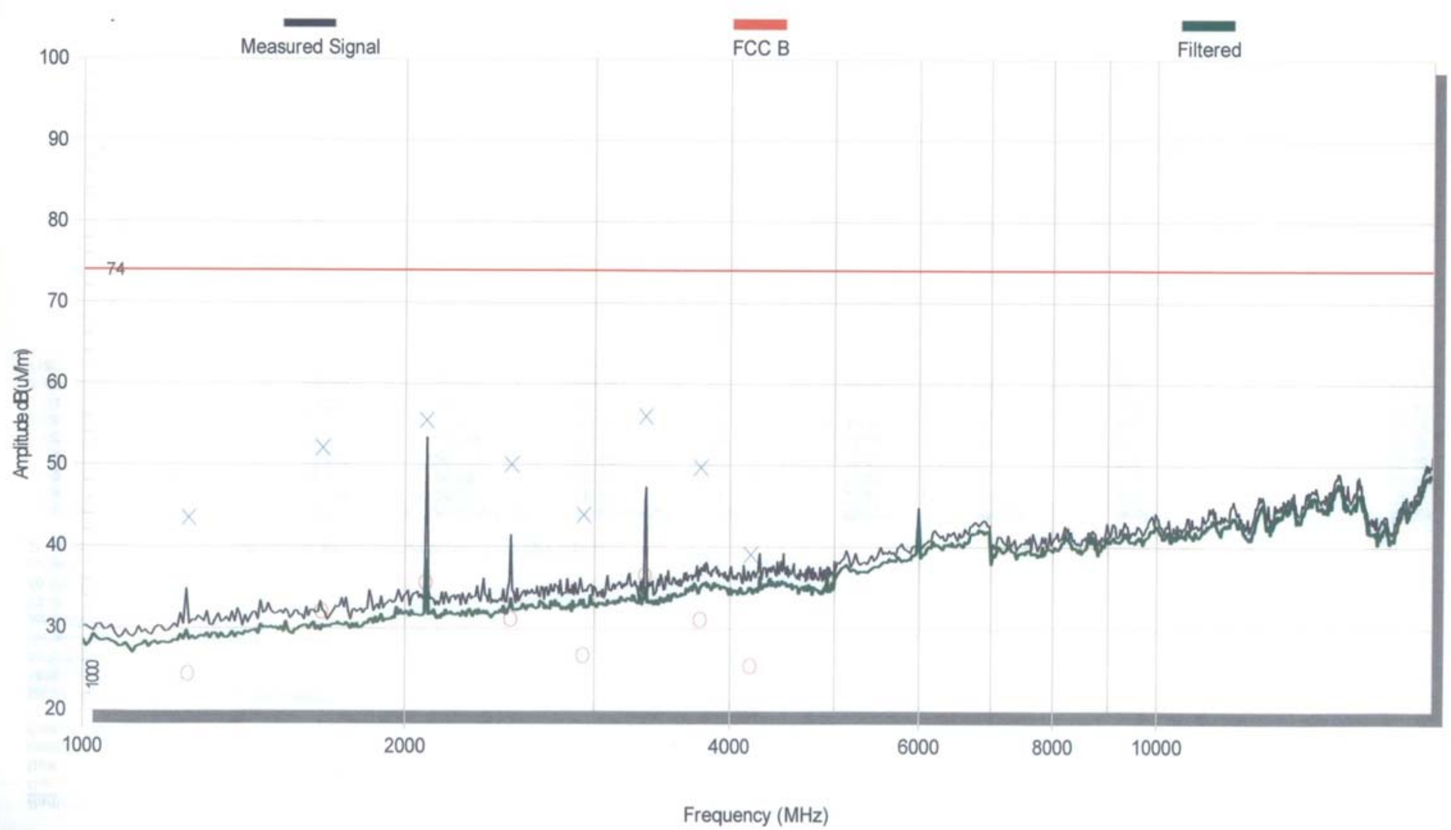


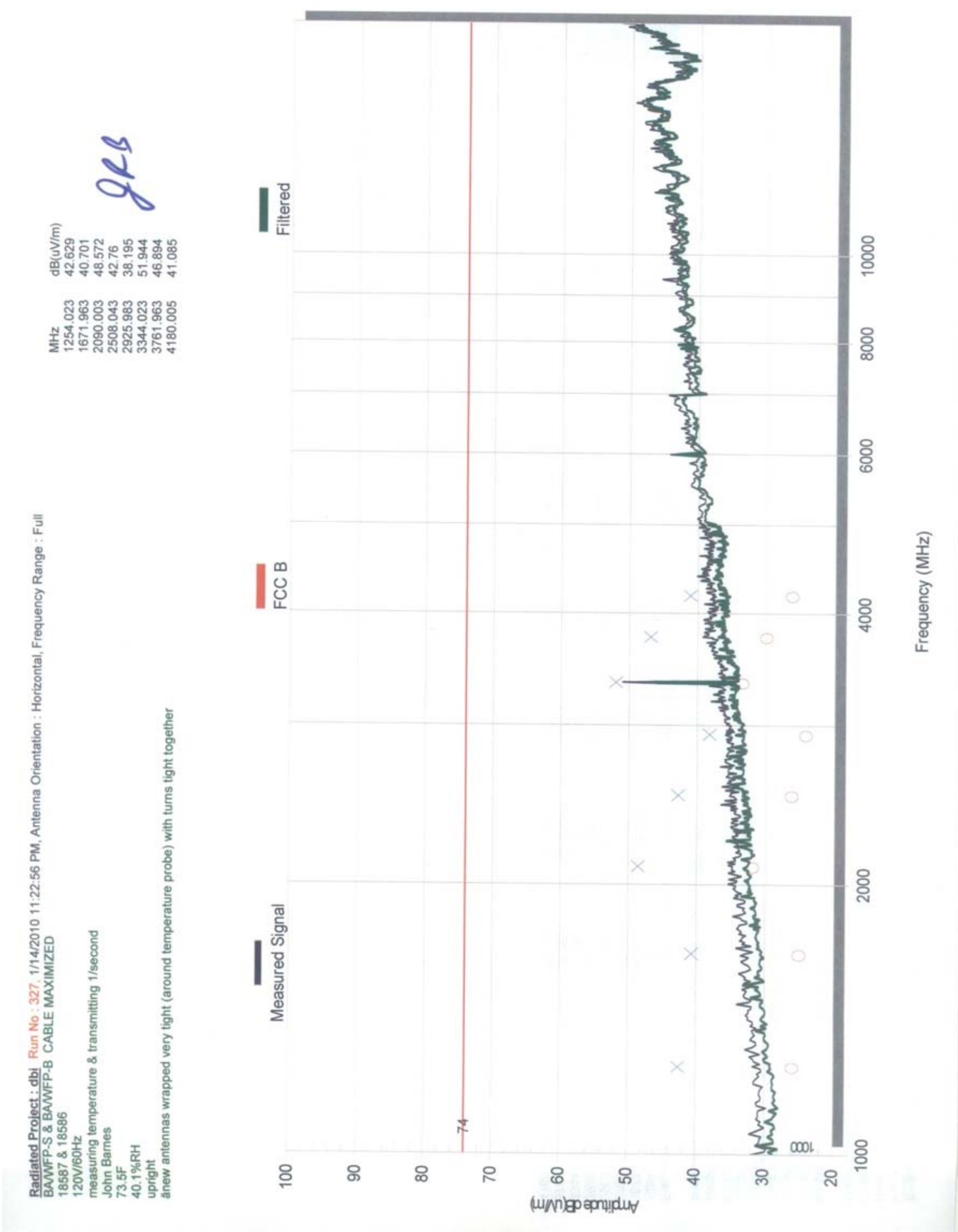
Radiated Project : dbi Run No : 325, 1/14/2010 10:08:06 PM, Antenna Orientation : Horizontal, Frequency Range : Full
BA/WFP-S & BA/WFP-B CABLE MAXIMIZED
18587 & 18586
120V/60Hz
measuring temperature & transmitting 1/second
John Barnes
73.5F
40.1%RH
upright
ănew antennas wrapped very tight (around temperature probe) with turns tight together
MHz
418.004
835.998
dB(uV/m)
53.915
28.66
Measured Signal
FCC B
Filtered
54
46
43.5
40
Amplitude dB(uV/m)
Frequency (MHz)
30
88
100
216
960

<u>Radiated Project : dbi</u> Run No : 326, 1/14/2010 11:10:20 PM, Antenna Orientation : Vertical, Frequency Range : Full
BA/WFP-S & BA/WFP-B CABLE MAXIMIZED
18587 & 18586
120V/60Hz
measuring temperature & transmitting 1/second
John Barnes
73.5F
40.1%RH
upright
ânew antennas wrapped very tight (around temperature probe) with turns tight together

MHz	dB(uV/m)
1254.023	43.508
1671.963	52.083
2090.003	55.486
2508.043	50.063
2925.983	43.872
3344.023	56.033
3761.963	49.716
4180.005	39.055

JRB




Radiated Project : dbi Run No : 327, 1/14/2010 11:22:56 PM, Antenna Orientation : Horizontal, Frequency Range : Full
BA/WFP-S & BA/WFP-B CABLE MAXIMIZED
18587 & 18586
120V/60Hz
measuring temperature & transmitting 1/second
John Barnes
73.5F
40.1%RH
upright
anew antennas wrapped very tight (around temperature probe) with turns tight together
MHz dB(uV/m)
1254.023 42.629
1671.963 40.701
2090.003 48.572
2508.043 42.76
2925.983 38.195
3344.023 51.944
3761.963 46.894
4180.005 41.085
Measured Signal
FCC B
Filtered
74
Amplitude dB(uV/m)
Frequency (MHz)
100
90
80
70
60
50
40
30
20
1000
2000
4000
6000
8000
10000

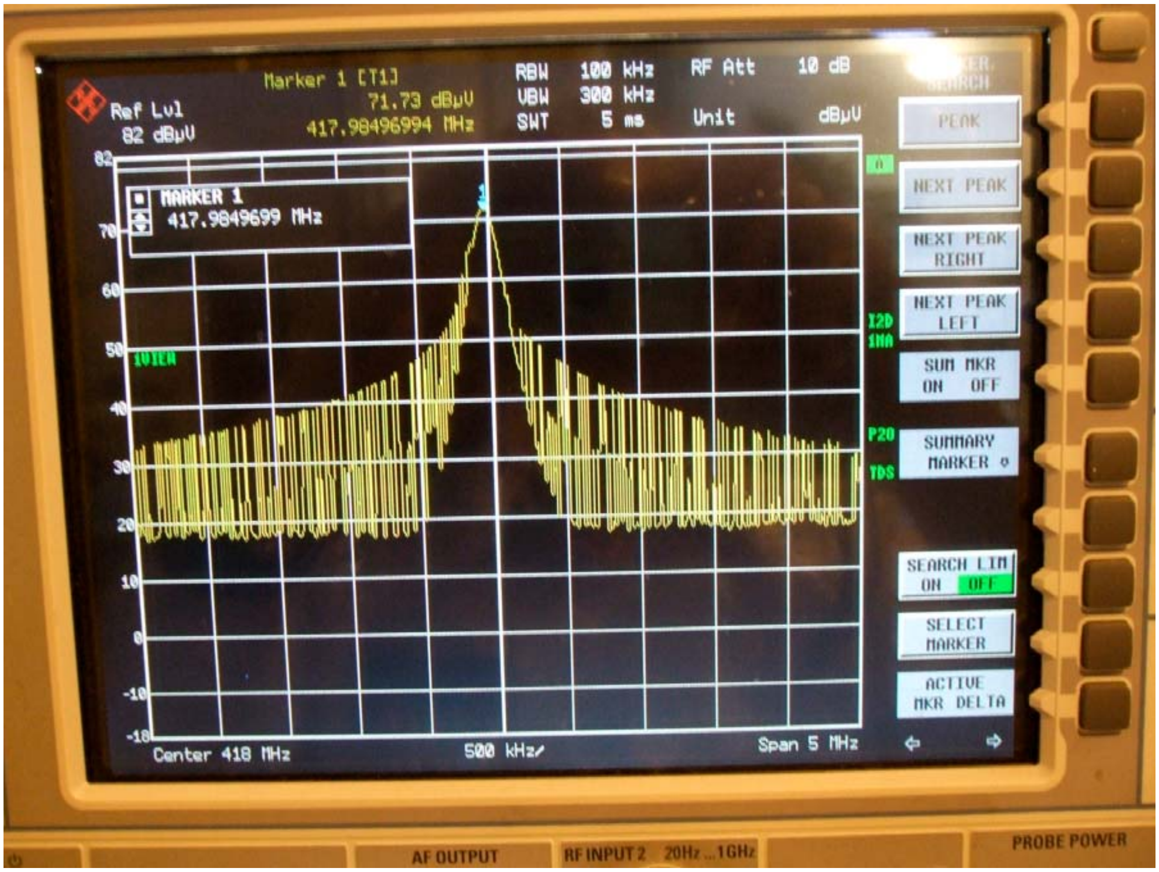
Transmitted Bandwidth Data

Appliance/Product: Wireless Food Probe
Model/Type Number: BA/WFP-S
FCC ID: T4FSM061025
Rating: 3.6VDC (Lithium battery)
Serial Number: 18587 (80354020)

Appliance/Product: Wireless Food Probe
Model/Type Number: BA/WFP-B
FCC ID: T4FSM061025
Rating: 3.6VDC (Lithium battery)
Serial Number: 18586 (80354070)

Test Results: The 20dB transmitted bandwidth of the BA/WFP-S and BA/WFP-B is 460.9kHz (417.6844MHz to 418.1453MHz), 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 300kHz, with a sweep time of 5ms.

PROCEDURE: Test Performed Per ANSI 63.4 – 2003 and RSS-Gen Issue 2 (June 2007).



Signed_____________________________________**Date** __April 30, 2010__
John R. Barnes, PRESIDENT dBi Corporation

Conducted Emissions 150 kHz-30 MHz (Internal Battery)

Conducted Emission Standards:

FCC 47 CFR Part 15-2008, using ANSI C63.4-2003; section 15.231(e).
RSS-210 Issue 7 (June 2007), using RSS-Gen Issue 2 (June 2007), section A1.1.5

Appliance/Product: Wireless Food Probe
Model/Type Number: BA/WFP-S
FCC ID: T4FSM061025
Rating: 3.6VDC (Lithium battery)
Serial Number: 18587 (80354020)

Appliance/Product: Wireless Food Probe
Model/Type Number: BA/WFP-B
FCC ID: T4FSM061025
Rating: 3.6VDC (Lithium battery)
Serial Number: 18586 (80354070)

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: Tests performed at 15-35°C, any relative humidity, and any atmospheric pressure.

Before starting any approval tests, we do a Total Cal of the receiver, then do a Conducted Checkout of the LISN, 150kHz highpass filter, 10dB attenuator, and cables. The expanded uncertainty (k=2 for 95% probability) is +/-2.76dB on AC power; and +/-2.85dB on input/output cables.

The equipment-under-test (EUT) and auxiliary equipment (AE) are set up in the shielded room according to the test plan and the test procedure(s). The EUT plugs into the main line-impedance stabilization network (LISN). AE plugs into multi-outlet strips attached to separate LISN's. Long input/output cables are serpentined to keep them >40cm from the floor.

If standard cables are available for an EUT's input/output port(s), we prefer to use them. If cables are custom-made for each installation of an EUT, we use cables that are at least 1m long. At least one port of each type on the EUT is connected to AE with a cable—except that we do not put cables on ports that are used only for manufacturing or servicing. If the EUT has multiple ports of a certain type, we add cables (that may go to AE, terminate in dummy loads, or be left unterminated) until adding a cable makes less than a 2dB increase in the emissions. The additional cables needed may be determined by testing this

EUT, or by prior experience with these same input/output ports on previous products. If an EUT has several ports with identical functions that are mutually-exclusive— only one of them *can* be used in a particular installation of the EUT— we try to run the test with all of the cables attached, but only the noisiest port providing data to the EUT. If this configuration puts us over the limits, we experiment with one port at a time cabled to AE and providing data, with the other ports left unconnected. Then we make the official measurements with the noisiest port that will typically be used by users.

We set up the EUT, AE, input/output cables, and line cords/power cables in the configuration and typical operating mode that we think will maximize emissions. This may require some experimenting to determine for sure, but is usually the configuration/operating mode that has as many subsystems of the EUT active simultaneously as possible, at their highest resolution, and operating at maximum speed.

We run initial scans on phase and neutral. We quasipeak and average measure the 3-5 frequencies whose Conducted Emissions appear to be highest with respect to the test limits.

At any time during the approval testing, if a measurement is above or close to a limit, we try to determine the cause of the problem, and fix it. Fixes to the EUT will be documented in the test notes and test report. If a piece of AE is the source of the noise, we may try a replacement (such as another hub/router, or using a crossover cable in place of a hub), or move the AE outside of the chamber. If AE is the source of the noise, and we can't resolve the problem any other way, we will measure these frequencies with the AE turned on and again with it turned off. We then note in the test notes, test plots, and test report that the excessive emissions are due to __________ piece of AE.

We examine the initial plots to see which frequency on phase/neutral has the minimum margin versus the test limits. If the minimum margin is >6dB, we treate the cables as already being maximized, and perform the official tests. Otherwise we return to the AC line and frequency with the highest emissions. We take a baseline reading before we touch anything. Then we move cables and line cords, trying to increase the emissions at this frequency, until any further changes have no effect, or reduce the emissions. This becomes our maximized cable configuration for the official tests, which will be photographed and included in the test report.

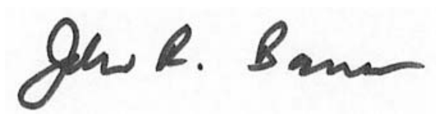
We now perform the official Conducted Emissions measurements. For each AC line (phase, neutral) we choose at least 10 frequencies that look "interesting". At each of these frequencies we do a narrowband scan to find the frequency with the least margin against the test limits. We quasipeak and average measure these specific frequencies on phase and neutral. These become our official measurements. We repeat this process for all AC input voltages/frequencies of interest.

When the test standards require Conducted Emissions measurements on an input/output cable, such as a phone line or Ethernet port, we connect this cable to an impedance stabilization network (ISN) if one is available. If we don't have a suitable ISN, we run this cable through a current probe and a voltage probe, and maybe through a bunch of ferrite cores, before connecting it to the AE (see CISPR 22/EN 55022 Appendix C). The EUT still plugs into the main LISN. We make one set of measurements per cable, with all other cables in the configuration that maximized AC Conducted Emissions.

In the tables below, "Cable Correction Factor dB" covers everything in the standard signal chain between the LISN/ISN/current clamp, and the EMI receiver. This includes a high-pass filter, a 10dB pad, and the coaxial cable to the EMI receiver.

When calibrating the chamber, we use a vector network analyzer (VNA) to measure the total power loss/gain from the connector going to the LISN/ISN/cable clamp to the connector going to the EMI receiver(s). This power loss/gain is our Cable Correction Factor.

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 __April 30, 2010__
John R. Barnes, PRESIDENT dBi Corp.

TESTING AND MEASURING EQUIPMENT USED AT LEXMARK

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

ARA Horn Antenna, 1GHz to 18GHz #0389	DRG-118/A, S/N 1091 (Cal date: 12/1997, Cal due date: not needed)
Schaffner-Chase BI-Log Antenna 30 to 1000 MHz #0509	CBL6111C, S/N 2459 (Cal date: 10/17/08, Cal due date: 10/17/10)
Rohde & Schwarz EMI Test Receiver #0632	ESIB7, S/N 100093 (Cal date: 10/13/09, Cal due date: 10/13/11)
Rohde & Schwarz EMI Test Receiver #0700	ESIB40, S/N 100148 (Cal date: 8/28/08, Cal due date: 8/28/10)

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.

RADIATED-EMISSIONS & BANDWIDTH TEST CONFIGURATION
BA/WFP-S & BA/WFP-B
5m SEMIANECHOIC CHAMBER
LEXMARK INTERNATIONAL, LEXINGTON KY.