

**dBi Corporation**  
**FCC Certification Test Report**

**Point Six, Inc.**  
**Point Sensor Counter**  
**FCC ID M5ZCNT**  
**Report Number 03dBi007**



**Laboratory**

## ADMINISTRATIVE INFORMATION

### **Historical Record:**

Because dBi Corporation is a testing entity, and not a manufacturer, this original test report is being transmitted to the manufacturer. dBi Corporation will keep a copy for its historical records and to satisfy A2LA-Audit requirements. We strongly recommend archiving the unit(s) that we tested to facilitate answering future inquiries regarding this product.

### **FCC Records:**

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

### **Measurement Uncertainties:**

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

### **Ongoing Compliance:**

The data contained in this test report applies only to the specific sample(s) tested, under the test conditions described herein. The manufacturer must ensure that all additional units have similar performance, by assembling them from components with identical electrical and mechanical characteristics. The manufacturer must also ensure that any modifications made to bring the test sample(s) into compliance are implemented on all production units.

The manufacturer has full responsibility for ensuring that the product continues to comply with the FCC requirements throughout its manufacturing life. The manufacturer should check all changes to the product that could change its interference profile.

### **A2LA Approval:**

dBi Corporation has been accredited by the American Association for Laboratory Accreditation (A2LA) for Radiated Emissions and Conducted Emissions 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.

**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**

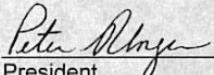
for technical competence in the field of

### **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. Testing and calibration laboratories that comply with this International Standard also operate in accordance with ISO 9001 or ISO 9002 (1994).

Presented this 14<sup>th</sup> day of June, 2002.



  
President  
For the Accreditation Council  
Certificate Number 1985-01  
Valid to September 30, 2004

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<sup>1</sup>  
216 Hillsboro Avenue  
Lexington, KY 40511-2105  
John R. Barnes Phone: 859 253 1178

#### ELECTRICAL (EMC)

Valid To: September 30, 2004

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:

<u>Test Technology</u>	<u>Test Method(s)</u>
Radiated Emissions	CFR 47, FCC Method Part 15, Class A and B (using ANSI: C63.4-1992, C63.4-2000, C63.4-2001) AS/NZS 3548-1995, AS/NZS CISPR 22:2002 CISPR 22-1985, 1993, 1997 EN 55022-1994, 1998 VCCI 1997, 2002
Conducted Emissions	CFR 47, FCC Method Part 15, Class A and B (using ANSI C63.4-1992, C63.4-2000, C63.4-2001) AS/NZS 3548-1995, AS/NZS CISPR 22:2002 CISPR 22-1985, 1993, 1997 EN 55022-1994, 1998 VCCI 1997, 2002

#### On materials and products related to the following:

Information Technology Equipment - Computers, Printers, Peripheral Devices

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

A handwritten signature in cursive script, likely belonging to Peter M. Meyer.

(A2LA Cert. No. 1985.01) 06/14/02

Page 1 of 1

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



## ADMINISTRATIVE DATA

**Manufacturer:**

Point Six, Inc.  
391 Codell Dr  
Lexington, KY 40509 USA

**Product:** Point Sensor Counter

**Model/Type Number:** None

**FCC ID:** M5ZCNT

**Rating:** Not applicable (internal battery)

**Summary of Testing:** The test data in this report shows that the Point Sensor Counter complies with FCC 47 CFR Part 15, specifically with Section 15.231(e) for operation in the 418MHz band.

**Modifications Made to the Equipment Under Test (EUT) in Order to Comply:**  
None.

**Measurement Equipment Used:** see attached data sheets.

**Measurements According to:** FCC 47 CFR Part 15, using ANSI C63.4:1992

**Report Prepared by:**

John R. Barnes KS4GL, PE, NCE, ESDC Eng, SM IEEE

**Testing Performed by:**

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

**Testing Performed on:**

February 25-26, 2003

**Testing Performed at:**

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

<b>INFORMATION RELATING TO PRODUCT RF INTERFERENCE</b>
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**Product:** Point Sensor Counter

**Model/Type Number:** None

**FCC ID:** M5ZCNT

**Rating:** Not applicable (internal battery)

**Suppression Components:** none.

**Clock Frequencies:** 32.768kHz, 4MHz, 418MHz.

**Cables:** 12 foot unshielded cable to switch.

**Electronic Circuit Boards:** Counter PC Board, part number P1585

**Size of Device:** 22 mm high by 80 mm wide by 50 mm deep. Weight 0.05 kg.

## Radiated Emissions 30-4180 MHz

**Radiated Emission Standards:** FCC 47 CFR Part 15, using ANSI C63.4:1992 (Section 15.231(e) limits for operation in the 418MHz band).

**Product:** Point Sensor Counter

**Model/Type Number:** None

**FCC ID:** M5ZCNT

**Rating:** Not applicable (internal battery)

**Serial Number:** 001

**Host and Other Peripherals:** None

**Name of Test:** Radiated Interference

**Test Procedure:** ANSI C63.4:1992

**Test Location:** 10m & 3m Semianechoic chambers, Lexmark test facility, located in Lexington, KY

**Test Distance:** 3m

**Test Instrumentation:** See attached sheet

**Note:** Transmitting at 1 second intervals to speed up testing.

**Test Results:** Tables 1, 2, and 3, and the Transmitted Bandwidth measurements 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).

For the fundamental, under Section 15.231(e), the average limit is calculated by linear interpolation from 1500uV/m at 260MHz, to 5000uV/m at 470MHz when measured at 3m.  
Average limit =  $((5000\text{uV/m} - 1500\text{uV/m}) * (418\text{MHz} - 260\text{MHz}) / (470\text{MHz} - 260\text{MHz})) + 1500\text{uV/m}$   
= 4133uV/m =  $20 * \log(4133) \text{ dB(uV/m)} = 72.33\text{dB(uV/m)}$ . Section 15.35(b) sets the peak limit for the fundamental to 20 dB above the average limit, or 92.33dB(uV/m).

For spurious emissions, Section 15.231(e) sets the average limit to 20dB below the maximum permitted fundamental level, or 52.33dB(uV/m). Section 15.231(b)(2) permits this same limit of 52.33dB(uV/m) to be used for quasipeak measurements. Section 15.35(b) sets the peak limit to 20dB above the average limit, or 72.33dB(uV/m). Section 15.209 permits 53.98dB(uV/m) quasipeak from 960-1000MHz, 53.98dB(uV/m) average above 1000MHz, and with Section 15.35(b), 73.98dB(uV/m) peak above 1000MHz when measured at 3m.

**SIGNED** \_\_\_\_\_ **DATE** February 27, 2003  
**John R. Barnes KS4GL, PE, NCE, ESDC Eng, SM IEEE, PRESIDENT dBi Corp.**

<b>Radiated Emissions Data 30-4180 MHz</b>
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**TABLE 1 Quasipeak Measurements**

Receiver	Vertical	Horizontal	Cable	Antenna	Vertical	Horizontal	15.231(e)
Meas. Freq.	Reading	Reading	Factor	Factor	Field Str.	Field Str.	Limit
MHz	dB(uV)*	dB(uV)*	dB	dB(1/m)	dB(uV/m)	dB(uV/m)	dB(uV/m)
417.93	56.46	66.83	1.11	17.19	74.76	85.13	-----
835.86	12.28	19.30	1.69	22.46	36.43	43.45	52.33

**Sample Calculation:** Receiver reading dB(uV) plus Cable factor dB plus Antenna correction factor dB(1/m) equals Radiated Field Strength dB(uV/m).

\* Checked in three orthogonal axes—see pictures of test setups.

**TABLE 2 Average Measurements**

Receiver	Vertical	Horizontal	Cable	Antenna	Vertical	Horizontal	15.231(e)
Meas. Freq.	Reading	Reading	Factor	Factor	Field Str.	Field Str.	Limit
MHz	dB(uV)	dB(uV)	dB	dB(1/m)	dB(uV/m)	dB(uV/m)	dB(uV/m)
417.93	19.79	30.51	1.11	17.19	38.09	48.81	72.33
835.86	2.47	2.93	1.69	22.46	26.62	27.08	52.33
1253.95	11.68	12.43	2.13	24.06	37.87	38.62	53.98
1671.94	13.18	12.94	2.42	25.48	41.08	40.84	53.98
2089.92	14.76	14.76	2.89	26.90	44.55	44.55	53.98
2507.90	12.36	12.37	3.15	28.28	43.79	43.80	53.98
2925.89	13.07	13.06	3.63	29.66	46.36	46.35	53.98
3343.87	12.05	12.04	4.09	30.21	46.35	46.34	53.98
3761.85	13.09	13.09	4.07	30.59	47.75	47.75	53.98
4179.84	11.66	11.65	4.20	31.34	47.20	47.19	53.98

**Sample Calculation:** Receiver reading dB(uV) plus Cable factor dB plus Antenna correction factor dB(1/m) equals Radiated Field Strength dB(uV/m).

**SIGNED** \_\_\_\_\_ **DATE** February 27, 2003  
**John R. Barnes KS4GL, PE, NCE, ESDC Eng, SM IEEE, PRESIDENT dBi Corp.**



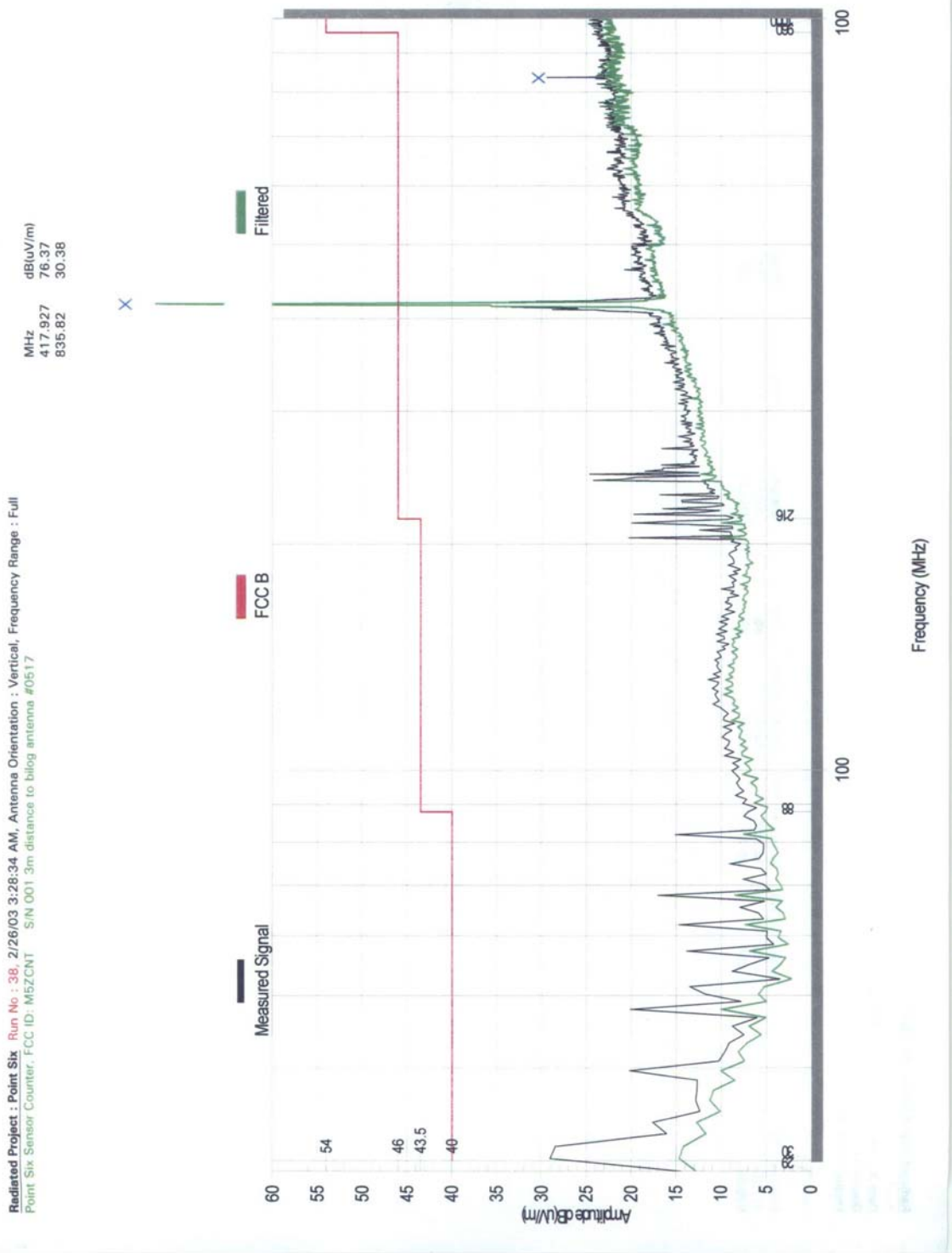
<b>Radiated Emissions Data 30-4180 MHz (continued)</b>
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**TABLE 3 Peak Measurements**

Receiver Meas. Freq. MHz	Vertical Reading dB(uV)	Horizontal Reading dB(uV)	Cable Factor dB	Antenna Factor dB(1/m)	Vertical Field Str. dB(uV/m)	Horizontal Field Str. sB(uV/m)	15.231(e) Limit dB(uV/m)
417.93	59.66	70.76	1.11	17.19	77.96	89.06	92.33
835.86	18.24	24.46	1.69	22.46	42.39	48.61	72.33
1253.95	31.59	35.96	2.13	24.06	57.78	62.15	73.98
1671.94	31.71	28.01	2.42	25.48	59.61	55.91	73.98
2089.92	30.54	31.44	2.89	26.90	60.33	61.23	73.98
2507.90	26.16	26.16	3.15	28.28	57.59	57.59	73.98
2925.89	26.85	26.71	3.63	29.66	60.14	60.00	73.98
3343.87	26.16	25.65	4.09	30.21	60.46	59.95	73.98
3761.85	26.44	27.11	4.07	30.59	61.10	61.77	73.98
4179.84	25.80	25.34	4.20	31.34	61.34	60.88	73.98

**Sample Calculation:** Receiver reading dB(uV) plus Cable factor dB plus Antenna correction factor dB(1/m) equals Radiated Field Strength dB(uV/m).

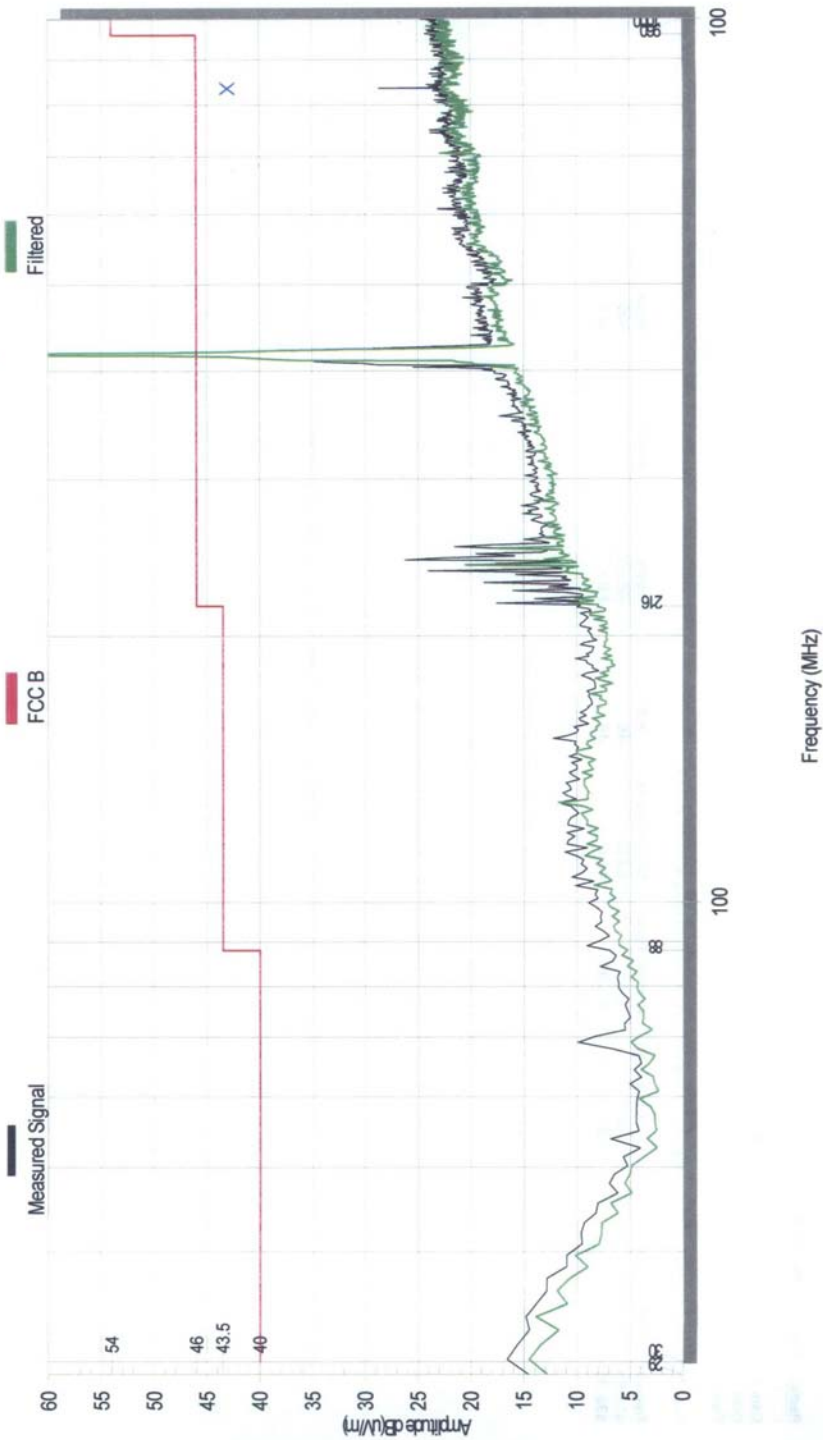
**SIGNED** \_\_\_\_\_ **DATE** February 27, 2003  
**John R. Barnes KS4GL, PE, NCE, ESDC Eng, SM IEEE, PRESIDENT dBi Corp.**



Radiated Project : Point Six Run No : 37 2/26/03 3:15:55 AM, Antenna Orientation : Horizontal, Frequency Range : Full  
Point Six Sensor Counter, FCC ID: M5ZCNT SIN 001 3m distance to biog antenna #0517

MHz  
417.997  
836.859

dB(uV/m)  
82.93  
43.07



## Transmitted Bandwidth Data

**Product:** Point Sensor Counter

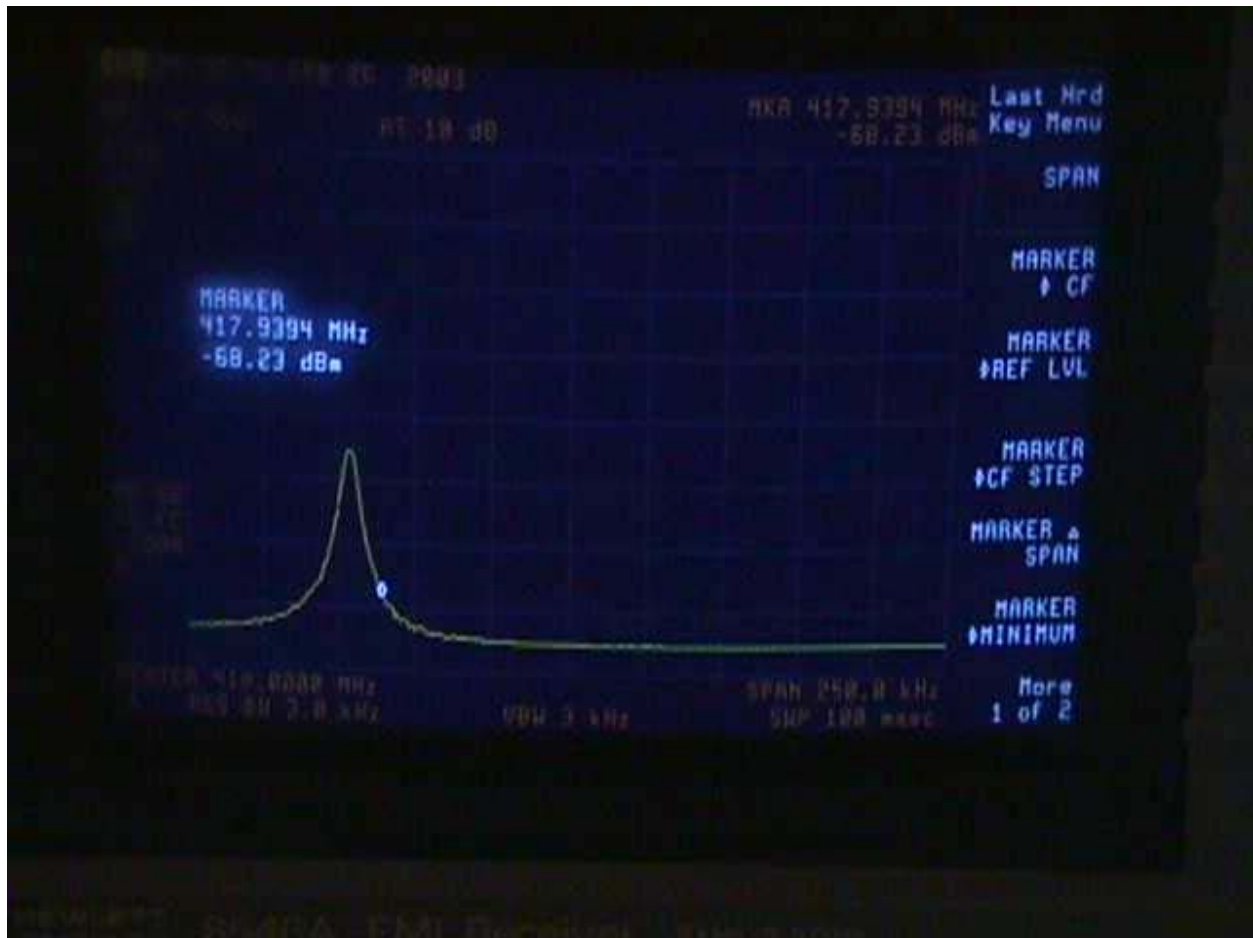
**Model/Type Number:** None

**FCC ID:** M5ZCNT

**Rating:** Not applicable (internal battery)

**Serial Number:** 001

**Test Results:** The 20dB transmitted bandwidth of Point Sensor Counter is 21.9kHz (417.9175MHz to 417.9393MHz), 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 25kHz, and each vertical division is 10dB. The IF bandwidth was 3kHz, and the AVG bandwidth was 3kHz for this measurement.



SIGNED \_\_\_\_\_ DATE February 27, 2003  
 John R. Barnes KS4GL, PE, NCE, ESDC Eng, SM IEEE, PRESIDENT dBi Corp.

**Conducted Emissions 0.15-30 MHz**

**Conducted Emission Standards:**

FCC 47 CFR Part 15, using ANSI C63.4:1992 (Section 15.231(e) limits for operation in the 418MHz band).

**Product:** Point Sensor Counter

**Model/Type Number:** None

**FCC ID:** M5ZCNT

**Rating:** Not applicable (internal battery)

**Serial Number:** 001

**Host and Other Peripherals:** None

**Name of Test:** Powerline Conducted Interference

**Test Procedure:** ANSI C63.4:1992

**Test Location:** All welded shielded enclosure (18 ft x 18ft), Lexmark test facility, located at Lexington Kentucky.

**Test Instrumentation:** See attached sheet

**Note:** Transmitting at 1 second intervals to speed up testing.

**Test Results:** This unit operates off an internal battery, and has no mains port. Therefore it passes the conducted interference requirements of FCC Part 15 Section 15.207(d) without testing.

**SIGNED** \_\_\_\_\_ **DATE** February 27, 2003  
**John R. Barnes KS4GL, PE, NCE, ESDC Eng, SM IEEE, PRESIDENT dBi Corp.**

<b>TESTING AND MEASURING EQUIPMENT USED AT LEXMARK</b>
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**Radiated Interference Plots 30...1,000 MHz and Transmitted Bandwidth Measurements:**

Hewlett Packard	85462A/85460A, S/N 3807A00454/3704A00416
EMI Test Receiver & RF Filter Section #0413	(Cal date: 4/30/2002, Cal due date: 4/30/2003)

Schaffner-Chase	CBL6111C, S/N 2580
BI-Log Antenna 30 to 1000 MHz #0517	(Cal date: 10/9/2002, Cal due date: 10/9/2003)

**Radiated Interference Measurements 30...1,000 MHz:**

Rohde & Schwarz	ESIB7, S/N 100093
EMI Test Receiver #0632	(Cal date:9/6/02, Cal due date:9/6/03)

Schaffner-Chase	CBL6111C, S/N 2460
BI-Log Antenna 30 to 1000 MHz #0507	(Cal date: 10/9/2002, Cal due date: 10/9/2003)

**Radiated Interference Measurements 1GHz and up:**

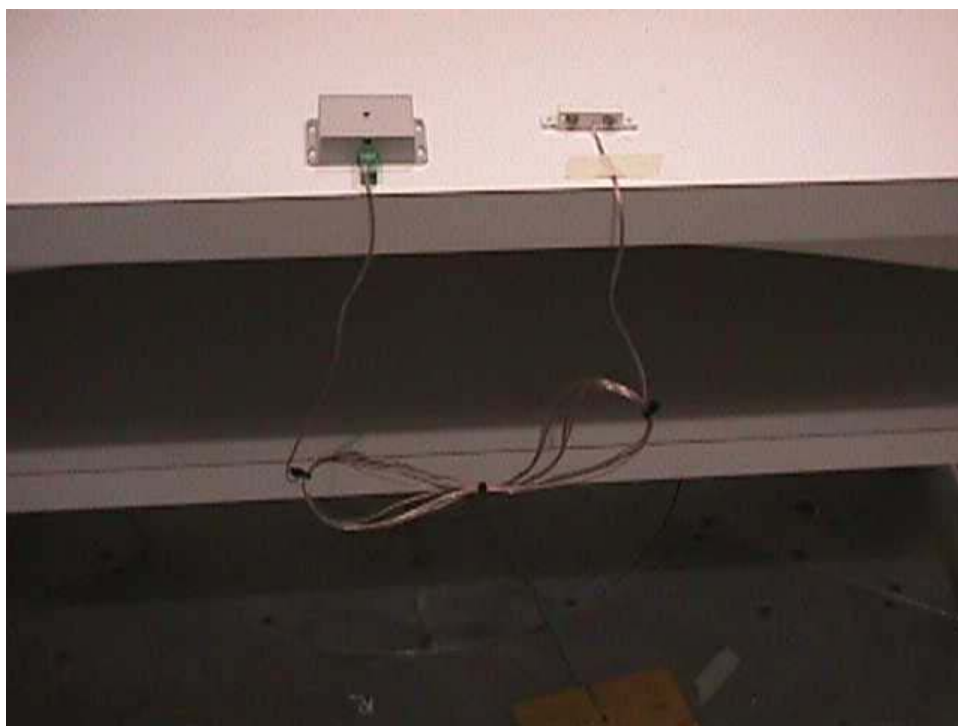
Rohde & Schwarz	ESIB7, S/N 100093
EMI Test Receiver #0632	(Cal date:9/6/02, Cal due date:9/6/03)

ARA	DRG-118/A, S/N 1091
Horn Antenna, 1GHz to 18GHz #0389	(Cal date: 12/1997, Cal due date: not needed)

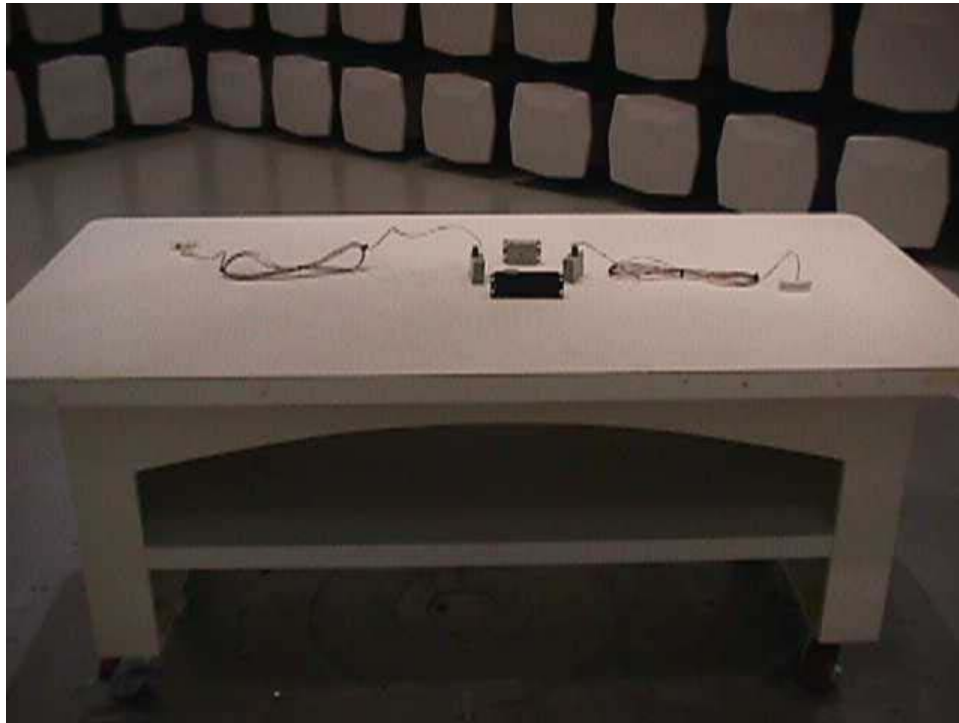
**Calibration:** The measuring equipment used at Lexmark is calibrated according to the instruction manual once a day. Once a week the accuracy of the test system is checked. This includes the test equipment, associated cables, and antennas. This is accomplished with a calibrated radiating source for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

**Please note,** all of the above equipment and all associated accessories are verified by Lexmark International.

## TEST SETUPS

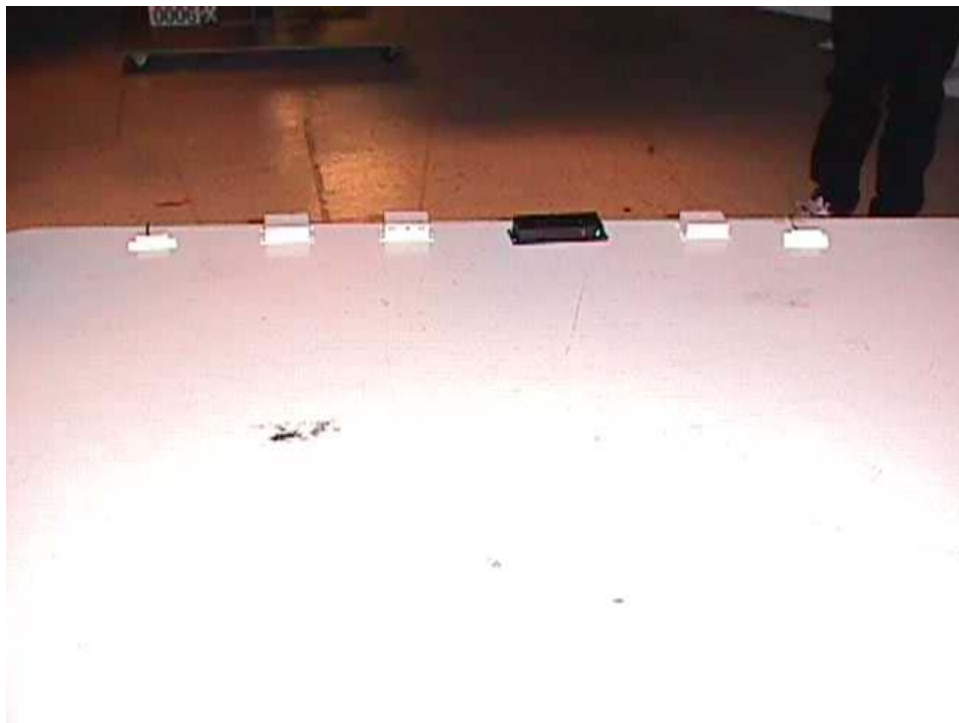


**RADIATED TEST CONFIGURATION 30-1000MHz**



**RADIATED TEST CONFIGURATION 30-1000MHz Three Orthogonal Axes**





**RADIATED TEST CONFIGURATION 1000-4180MHz**