



**FCC PART 15 SUBPART C  
CERTIFICATION REPORT**

**FOR**

**433.92 MHz COMMERCIAL SENSOR**

**MODEL: 200.0101.R**

**FCC ID NO: NATTX433CS-3**

**REPORT NO: 04U2651-1**

**ISSUE DATE: APRIL 6, 2004**

*Prepared for*  
**SMARTIRE SYSTEMS INC.  
#150 13151 VANIER PLACE  
RICHMOND, BC  
CANADA**

*Prepared by*  
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d.b.a.  
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**TABLE OF CONTENTS** **PAGE**

1. VERIFICATION OF COMPLIANCE .....	3
2. PRODUCT DESCRIPTION .....	4
3. TEST FACILITY .....	4
4. MEASUREMENT STANDARD .....	4
5. TEST METHODOLOGY .....	4
6. MEASUREMENT EQUIPMENT USED .....	4
7. POWERLINE RFI LIMIT .....	5
8. RADIATED EMISSION LIMITS .....	5
9. SYSTEM TEST CONFIGURATION .....	6
10. TEST PROCEDURE .....	7
11. EQUIPMENT MODIFICATIONS .....	8
12. TEST RESULT .....	9
12. TEST RESULT .....	9
12.1 MAXIMUM MODULATION PERCENTAGE (M%) .....	9
12.2 EMISSION BANDWIDTH .....	9

**TEST DATA**

- Maximum Modulation Percentage Plot
- Emission Bandwidth Plot
- Radiated Emission Worksheet for Peak Measurement
- Radiated Emission Worksheet for Average Measurement

**ATTACHMENT**

- EUT Photographs
- Proposed FCC ID Label
- Schematics & Block Diagram
- User Manual

## 1. VERIFICATION OF COMPLIANCE

COMPANY NAME : SMARTIRE SYSTEMS INC.  
#150, 13151 VANIER PLACE  
RICHMOND BC, CANADA

EUT DESCRIPTION : 433.92 MHz COMMERCIAL SENSOR

MODEL NO : 200.0101.R

FCC ID : NATTX433CS-3

DATE TESTED : 4-5-2004

REPORT NUMBER : 04U2651-1

TYPE OF EQUIPMENT	COMMERCIAL SENSOR
EQUIPMENT TYPE	433.92MHz TRANSMITTER
MEASUREMENT PROCEDURE	ANSI C63.4 / 2001
LIMIT TYPE	CERTIFICATION
FCC RULE	CFR 47, PART 15

The above equipment was tested by Compliance Certification Services for compliance with the requirements set forth in the FCC CFR 47, PART 15. The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties. **Warning** : This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification will constitute fraud and shall nullify the document.

Tested By:



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CHIN PANG  
EMC TECHNICIAN  
COMPLIANCE CERTIFICATION SERVICES

Approved & Released By:



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THU CHAN  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

## 2. PRODUCT DESCRIPTION

Fundamental Frequency	<b>433.92 MHz</b>
Power Source	<b>3V Battery</b>
Transmitting Time	<b>Interval: 3-5 minutes; Length: 500ms</b>
Associated Receiver	<b>NA</b>
Manufacturer	<b>Smartire Systems Inc.</b>

## 3. TEST FACILITY

The 3/10/30 meter open area test site and conducted measurement facility used to collect the radiated data is located at 561F Monterey Road, Morgan Hill, California, U.S.A. A detailed description of the test facility was submitted to the Commission on May 27, 1994.

## 4. MEASUREMENT STANDARD

The site is constructed and calibrated in conformance with the requirements of ANSI C63.4/2001.

## 5. TEST METHODOLOGY

For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 KHz, up to at least the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower. (CFR 47 Section 15.33)

## 6. MEASUREMENT EQUIPMENT USED

TEST EQUIPMENT LIST				
Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	11/21/2004
RF Filter Section	HP	85420E	3705A00256	11/21/2004
Bilog Antenna	Sunol Sciences	JB1 Antenna	A121003	12/22/2004
Amplifier 1-26GHz	MITEQ	NSP2600-SP	924341	4/25/2004
Spectrum Analyzer, 26.5 GHz	HP	8593EM	3710A00205	10/1/2004
Antenna, Horn 1 ~ 18 GHz	EMCO	3117	29310	12/26/2004
Spectrum Analyzer	Agilent	E4446A	MY43360112	1/13/2005

## 7. POWERLINE RFI LIMIT

CONNECTED TO AC POWER LINE	SECTION 15.207
CARRIER CURRENT SYSTEM IN THE FREQUENCY RANGE OF 150 KHz TO 30 MHz	SECTION 15.205 AND SECTION 15.209, 15.221, 15.223, 15.225 OR 15.227, AS APPROPRIATE.
BATTERY POWER	NOT REQUIRED

## 8. RADIATED EMISSION LIMITS

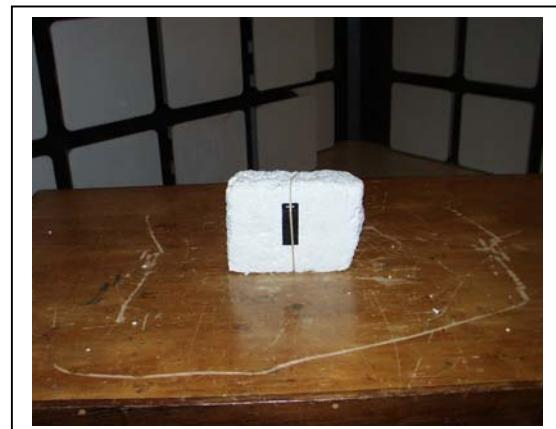
GENERAL REQUIREMENTS	SECTION 15.209
RESTRICTED BANDS OF OPERATION	SECTION 15.205
PERIODIC OPERATION IN THE BAND 40.66 - 40.70 MHz AND ABOVE 70 MHz.	SECTION 15.231(e)

## 9. SYSTEM TEST CONFIGURATION

Use a block of foam and combined it with EUT wrapping rubber band around it. This way it can test X.Y, and Z axis. To activate continuous transmission, place a small plastic block between rubber band and EUT push button.



X-Axis



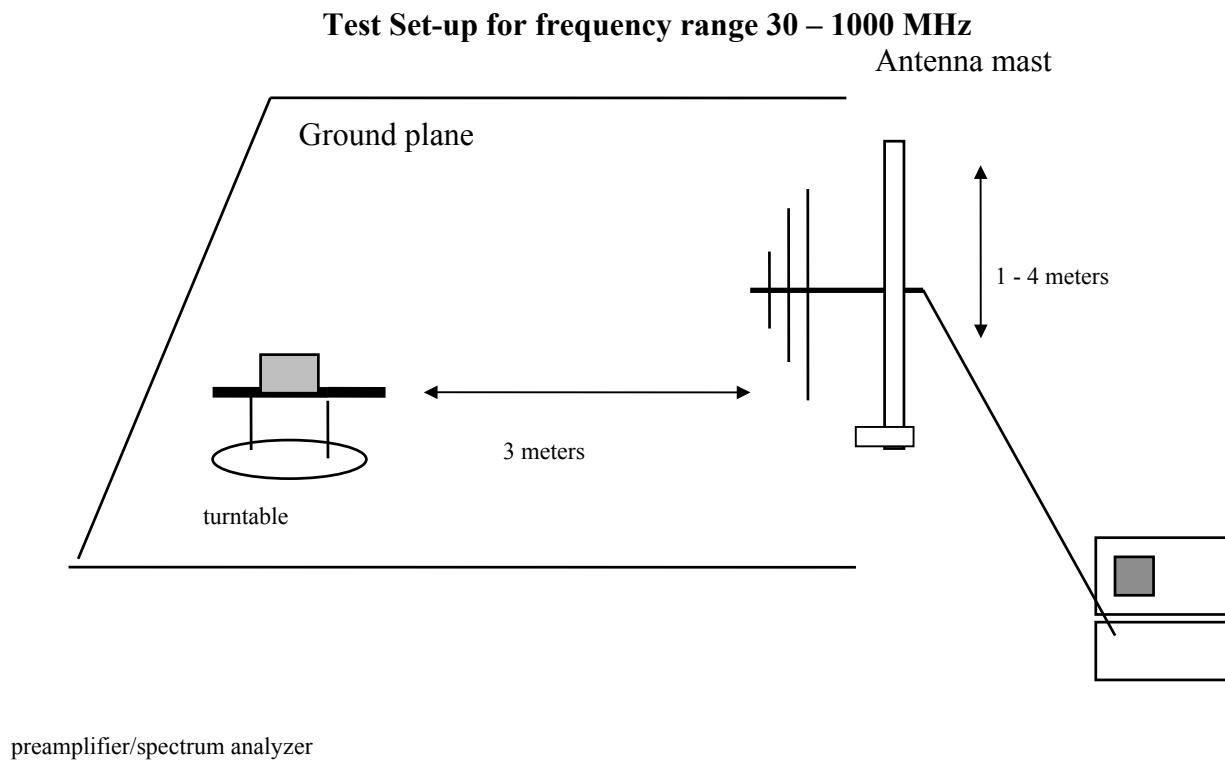
Y-Axis



Z-Axis

## Radiated Open Site Test Set-up

**10. TEST PROCEDURE**  
**Radiated Emissions, 15.231(4)(b)**



**Fig. 1**

1. The EUT was placed on a wooden table on the outdoor ground plane. The search antenna was placed 3-meters from the EUT.
2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205. The EUT was moved throughout the XY, XZ, and YZ planes to maximize emissions received by the search antenna.
3. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recorded in the data listed below.

### Test set-up for measurements above 1GHz

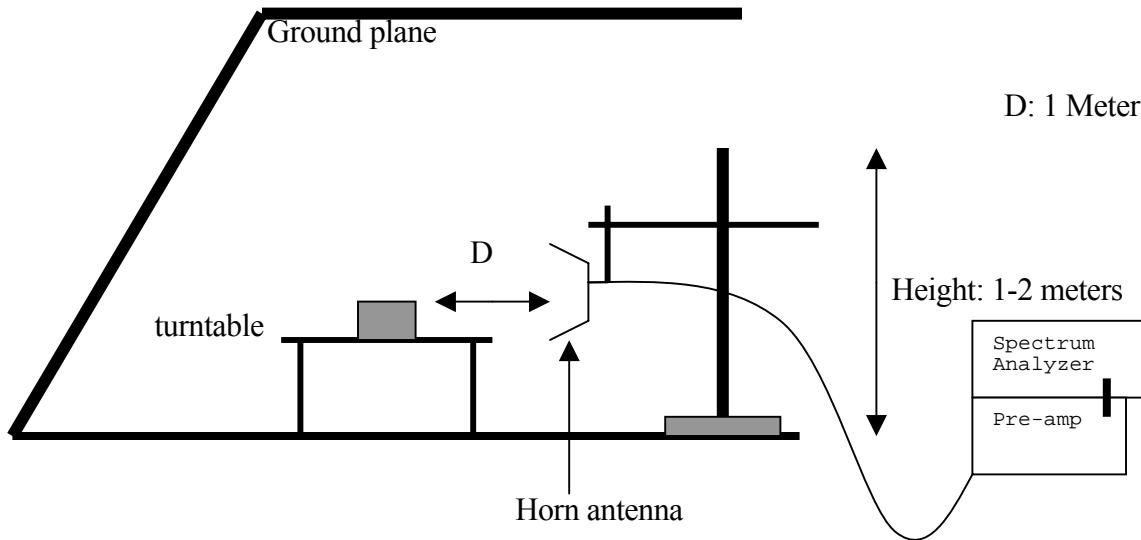


FIG. 2

1. The EUT was placed on a wooden table on the outdoor ground plane. The search antenna was placed 1-meters from the EUT. The EUT antenna was mounted vertically as per normal installation.
2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205. The EUT was moved throughout the XY, XZ, and YZ planes to maximize emissions received by the search antenna.
3. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recorded in the data listed below.

## 11. EQUIPMENT MODIFICATIONS

To achieve compliance to FCC Section 15.231 technical limits, the following change(s) were made during compliance testing:

No changes were required in order to achieve compliance to Section 15.231 levels.

## 12. TEST RESULT

Powerline RFI Class B	Eut	Radiated Emission Limits	Eut
SECTION 15.207		SECTION 15.209	X
SECTION 15.205, 15.209, 15.221, 15.223, x 15.225 OR 15.227		SECTION 15.205	X
BATTERY POWER	X	SECTION 15.231 (e)	X

## 12.1 MAXIMUM MODULATION PERCENTAGE (M%)

## CALCULATION:

Average Reading = Peak Reading (dBuV/m) + 20log (Duty Cycle)

In order to determine possible Maximum Modulation percentage, alternations are made to the EUT. We measured:

WHERE 1 Period = 67.33ms  
 Long pulse = 0.4667 ms  
 Medium pulse = 0.300ms  
 Short pulse = 0.1333 ms  
 No of Long pulse = 1  
 No of Medium pulse = 8  
 No of Short pulse = 38

Duty Cycle = ( N1L1+N2L2+...+Nn-1Ln-1+NnLn)/100 or T

$$\text{Duty Cycle} = ((1 \times 0.4667) + (8 \times 0.3)) + (38 \times 0.1333) / 67.330 = 0.12 = 12\%$$

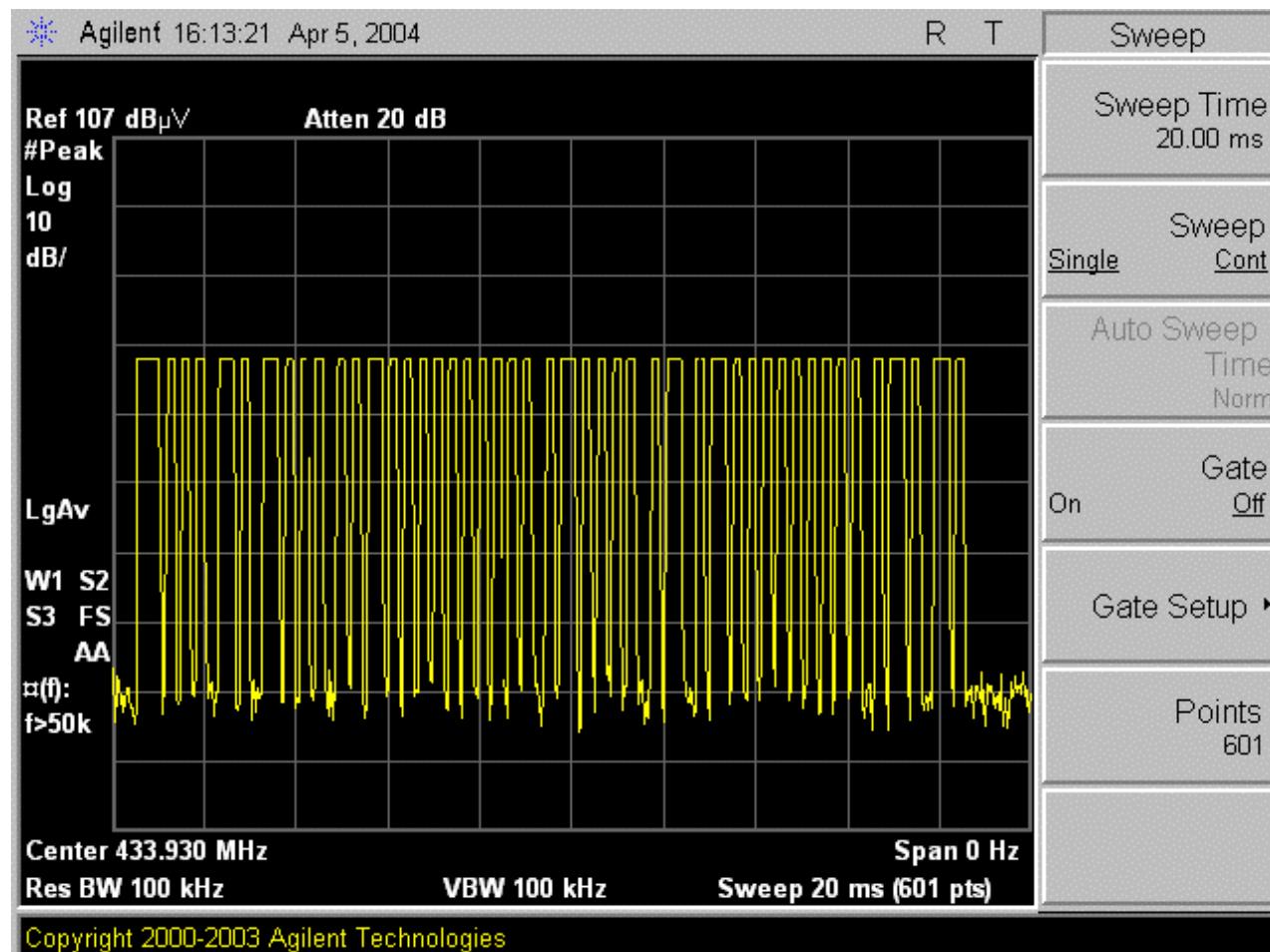
For duty cycle refer to plot #1, 2, 3,4, 5.

## 12.2 EMISSION BANDWIDTH

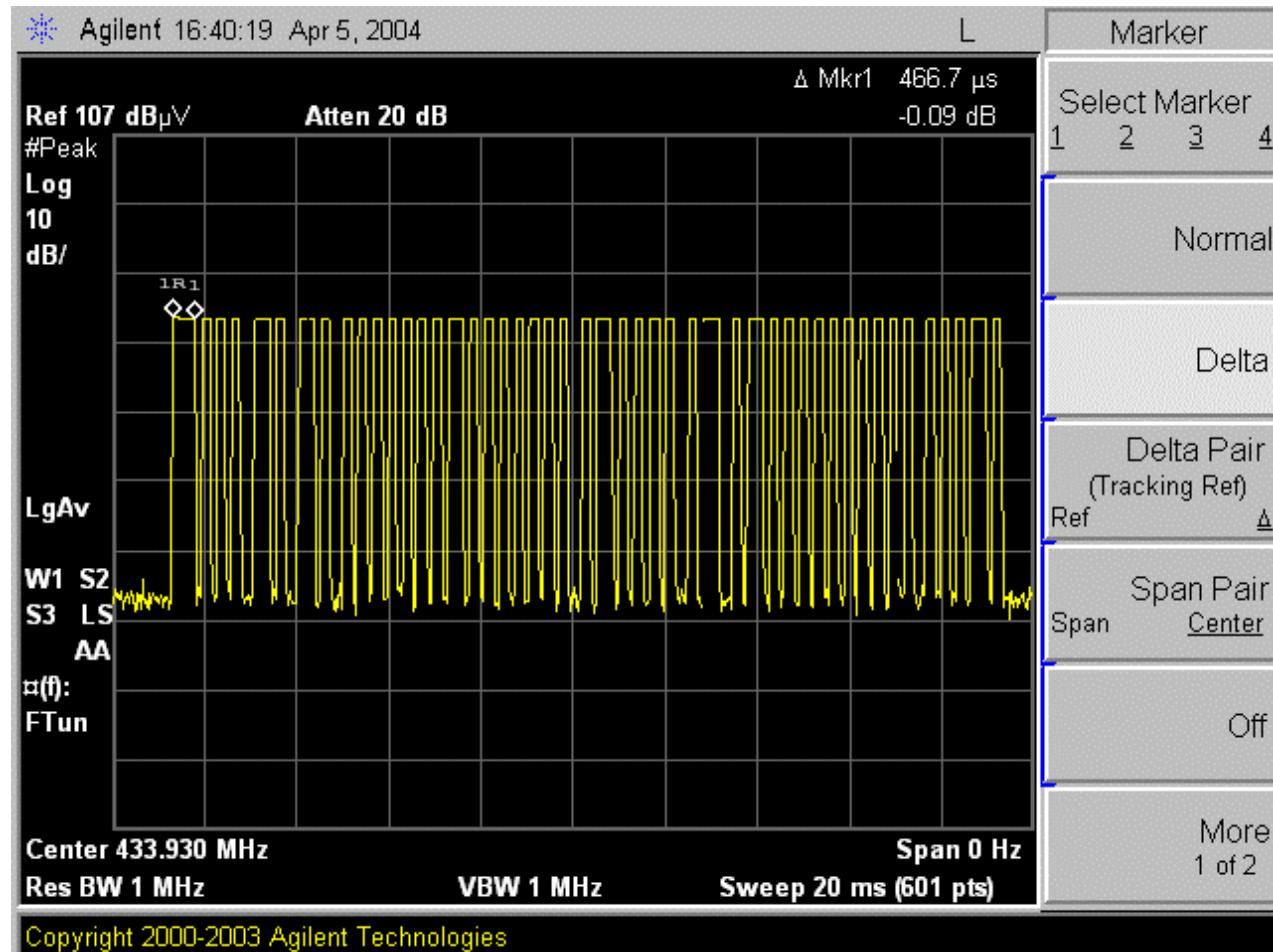
The bandwidth of the emissions were investigated per 15.231(c)

Center Frequency	Measured	Limits
433.92 MHz	<b>405 KHz</b> (refer to plot)	<b>433.93 x 0.25% = 1.0848MHz</b>

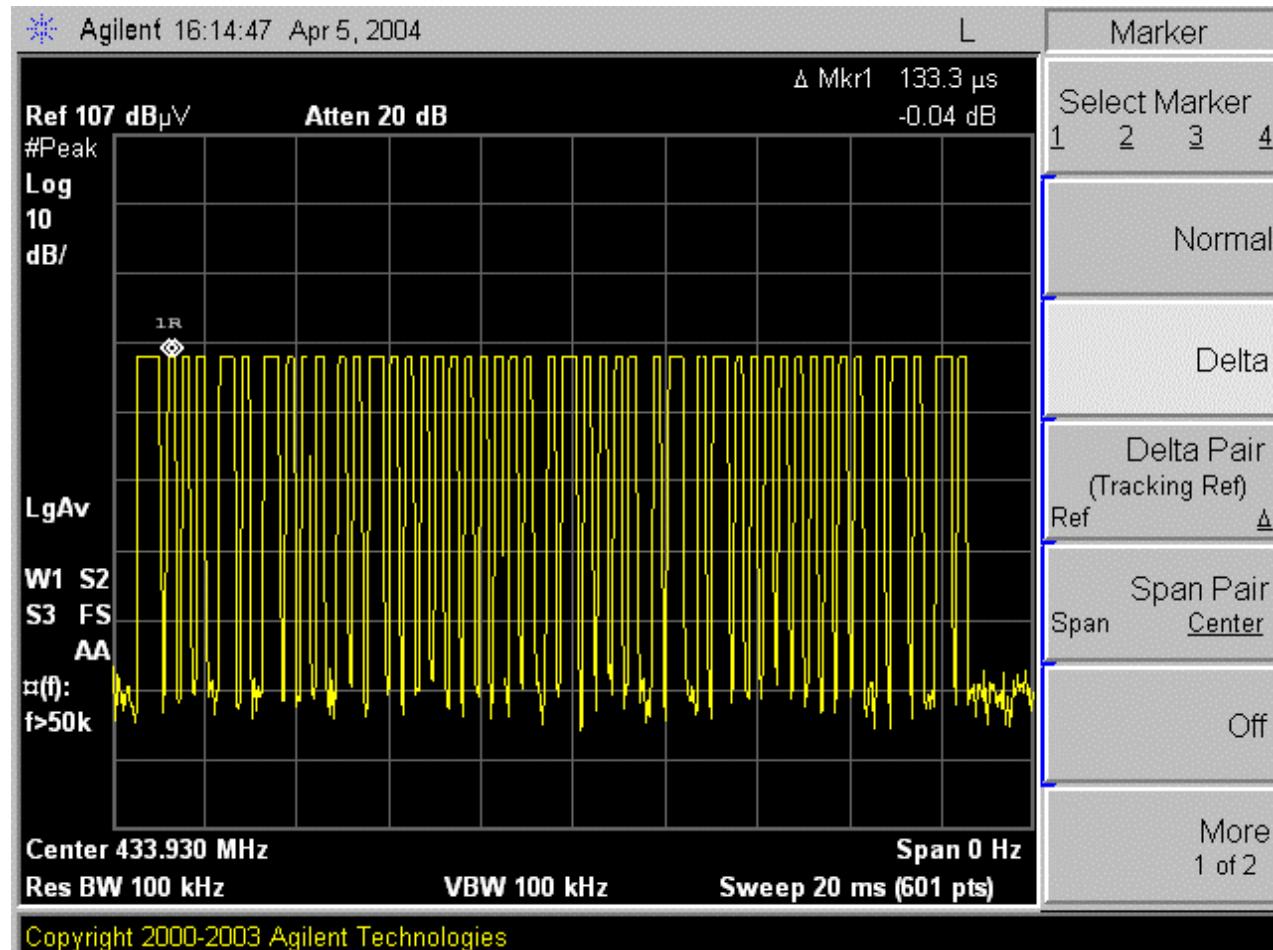
DUTY CYCLE 1



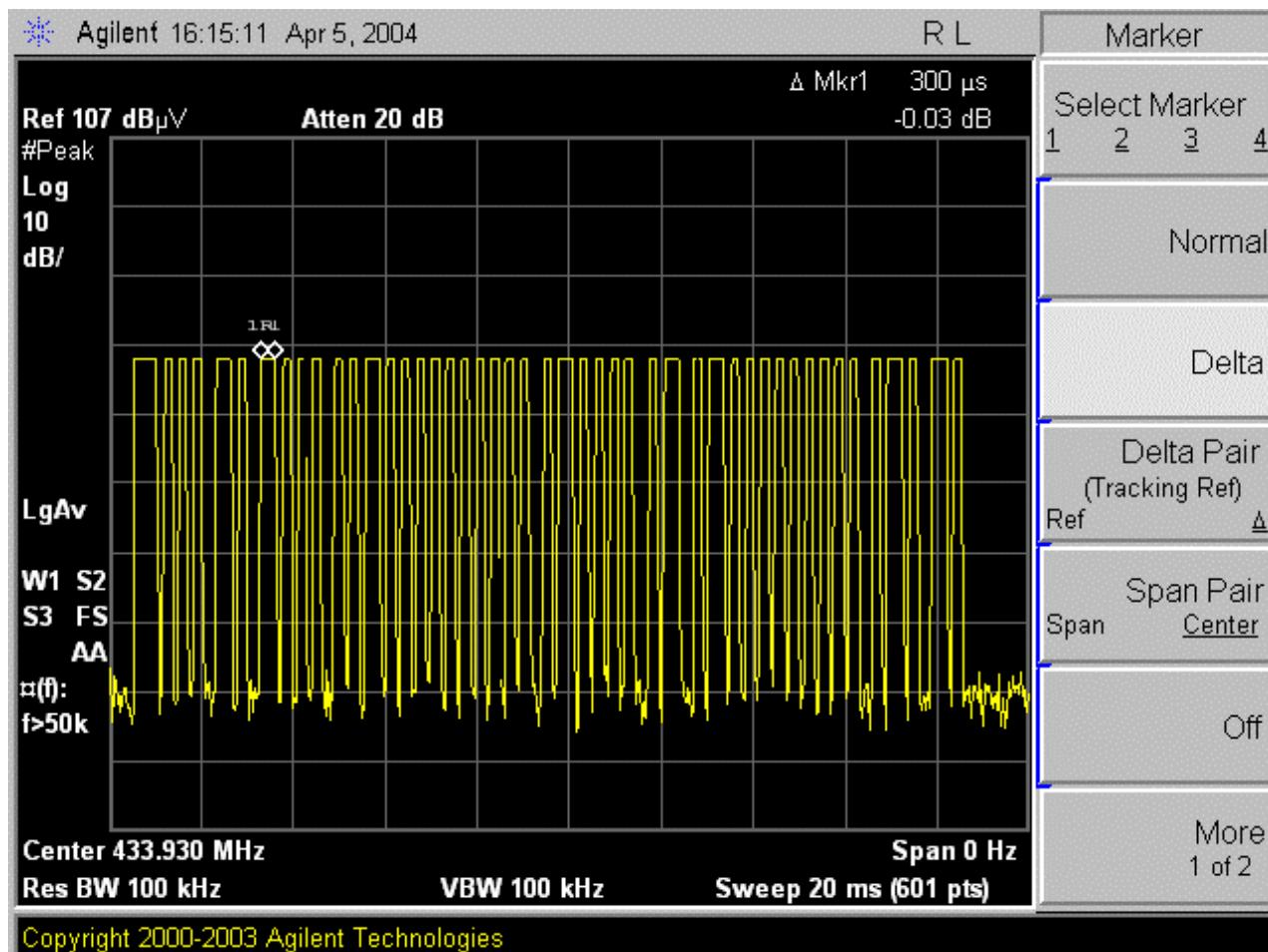
## DUTY CYCLE 2



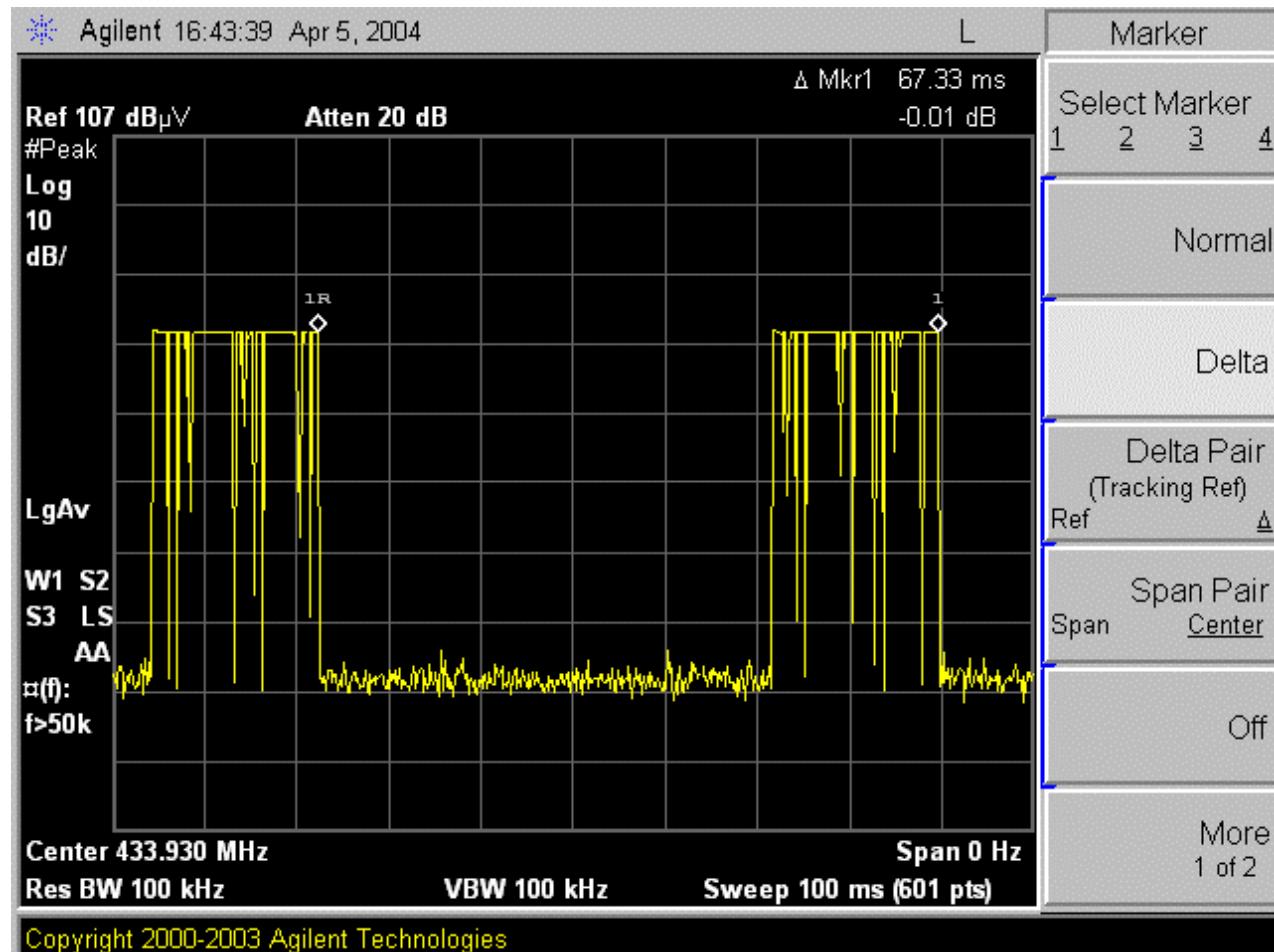
DUTY CYCLE 3



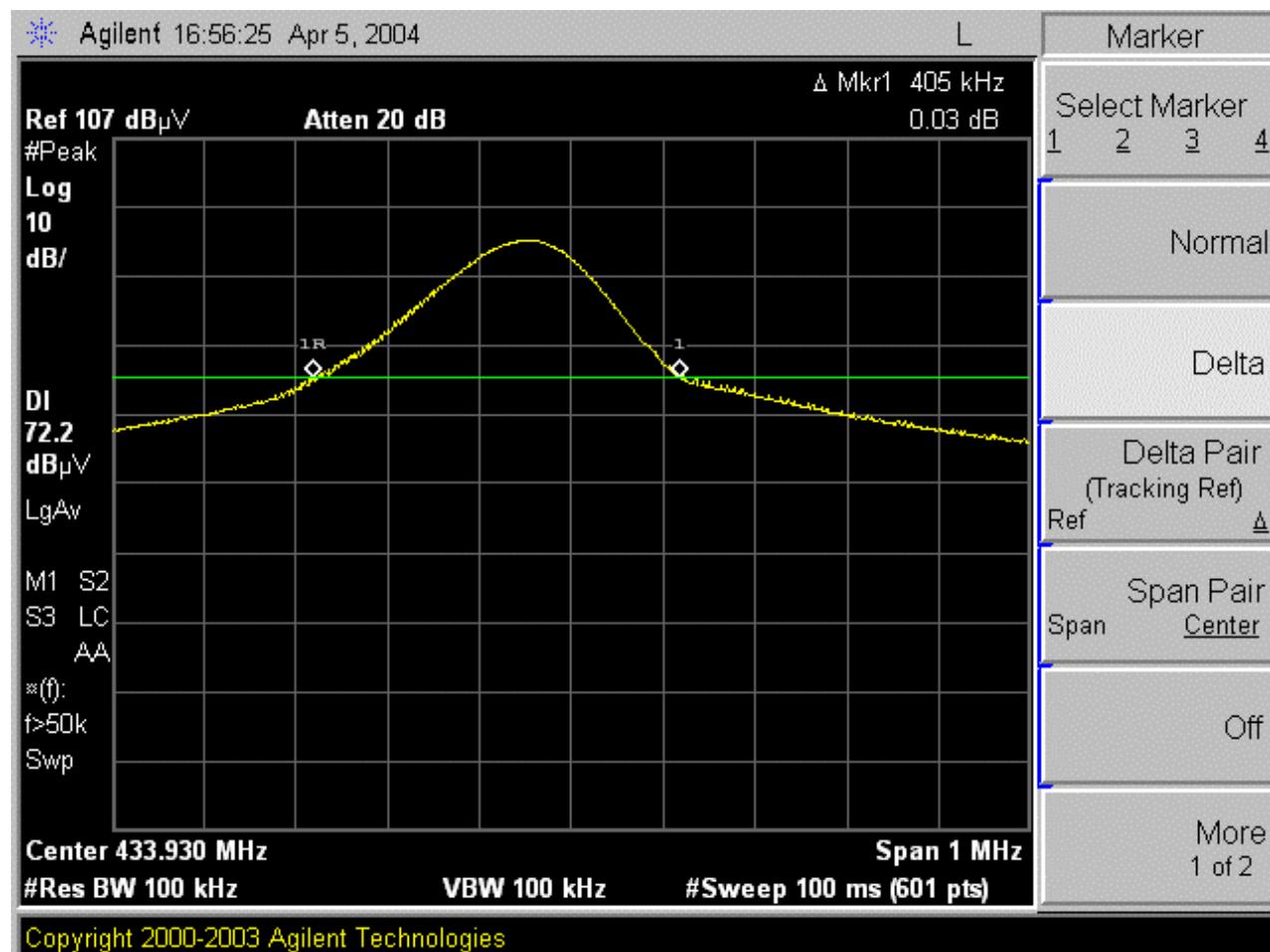
DUTY CYCLE 4



DUTY CYCLE 5



### EMISSION BANDWIDTH



## RADIATED DATA

<b>COMPLIANCE</b> Certification Services		<b>Project #:</b> 04U2651-1										
		<b>Report #:</b> 040404C1										
		<b>Date &amp; Time:</b> 4/4/2004 11:30AM										
		<b>Test Engr:</b> Chin Pang										
FCC, VCCI, CISPR, CE, AUSTEL, NZ UL, CSA, TUV, BSMI, DHHS, NVLAP												
561F MONTEREY ROAD, SAN JOSE, CA 95037-9001 PHONE: (408) 463-0885 FAX: (408) 463-0888												
<b>Company:</b> Smartire Systems Inc												
<b>EUT Description:</b> 433.92MHz Transmitter												
<b>Test Configuration :</b> EUT only												
<b>Type of Test:</b> FCC 15.231												
<b>Mode of Operation:</b> Transmitting												
M% = ((t1+t2+t3+...)/T)*67.33% = 11.8%		<b>Av Reading = PK Reading + 20*log(M%)</b> 20*log(M%) = -18.56										
Freq. (MHz)	Pk Rdg (dBuV)	Av Rdg (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)	Level (dBuV/m)	Limit FCC_B	Margin (dB)	Pol (H/V)	Az (Deg)	Height (Meter)	Mark (P/Q/A)
433.92Mhz Fundamental frequency												
X-Position ( stand Up )												
433.92	64.21	45.65	16.90	2.15	0.00	64.70	72.86	-8.16	3mV	0.00	1.00	P
433.92	64.71	46.15	16.90	2.15	0.00	65.20	72.86	-7.66	3mH	0.00	1.20	P
Y-Position ( Side Lay Down )												
433.92	67.03	48.47	16.90	2.15	0.00	67.52	72.86	-5.34	3mV	0.00	1.00	P
433.92	61.39	42.83	16.90	2.15	0.00	61.88	72.86	-10.98	3mH	0.00	1.50	P
Z-Position (Lay Down )												
433.92	59.53	40.97	16.90	2.15	0.00	60.02	72.86	-12.84	3mV	0.00	1.00	P
433.92	66.33	47.77	16.90	2.15	0.00	66.82	72.86	-6.04	3mH	0.00	1.50	P
The Data show Y-Position is the worst case												
867.86	33.20	14.64	22.45	3.13	0.00	40.22	52.86	-12.64	3mV	0.00	1.00	P
867.86	28.50	9.94	22.45	3.13	0.00	35.52	52.86	-17.34	3mH	0.00	1.50	P

## RADIATED EMISSIONS (HARMONIC)

04/04/04 **High Frequency Measurement**  
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr:Chin Pang  
Project #:04U2651-1  
Company:Smartire Systems Inc.  
EUT Descrip.:433.93MHz OOK Transmitter  
EUT M/N:SUPERHET  
Test Target:FCC 15.231  
Mode Oper:TX

**Test Equipment:**

EMCO Horn 1-18GHz	Spectrum Analyzer	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz
T120; S/N: 29310 @3m	HP 8593EM Analyzer	T86 Miteq 924341		
Hi Frequency Cables				
<input type="checkbox"/> (2 ft)	<input checked="" type="checkbox"/> (2 ~ 3 ft)	<input type="checkbox"/> (4 ~ 6 ft)	<input checked="" type="checkbox"/> (12 ft)	
			<b>Peak Measurements:</b> 1 MHz Resolution Bandwidth 1MHz Video Bandwidth	<b>Average Measurements:</b> 1 MHz Resolution Bandwidth 10Hz Video Bandwidth

f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
1.302	9.8	76.6	58.0	28.9	1.5	-43.9	0.0	0.0	62.9	44.4	74.0	54.0	-11.1	-9.6	V
1.736	9.8	73.8	55.2	30.4	1.6	-43.9	0.0	0.0	61.8	43.3	74.0	54.0	-12.2	-10.7	V
2.170	9.8	62.2	43.6	32.2	1.8	-43.9	0.0	0.0	52.3	33.8	74.0	54.0	-21.7	-20.2	V
2.604	9.8	57.8	39.3	32.8	2.0	-43.8	0.0	0.0	48.8	30.2	74.0	54.0	-25.2	-23.8	V
3.038	9.8	61.6	43.0	33.4	2.2	-43.8	0.0	0.0	53.3	34.7	74.0	54.0	-20.7	-19.3	V
3.471	9.8	70.4	51.8	33.5	2.3	-44.0	0.0	0.0	62.2	43.7	74.0	54.0	-11.8	-10.3	V
3.905	9.8	66.3	47.7	33.7	2.5	-44.2	0.0	0.0	58.2	39.7	74.0	54.0	-15.8	-14.3	V
4.339	9.8	68.6	50.1	34.0	2.7	-44.6	0.0	0.0	60.8	42.2	74.0	54.0	-13.2	-11.8	V
1.302	9.8	72.6	54.0	28.9	1.5	-43.9	0.0	0.0	59.0	40.4	74.0	54.0	-15.0	-13.6	H
1.736	9.8	72.1	53.5	30.4	1.6	-43.9	0.0	0.0	60.2	41.6	74.0	54.0	-13.8	-12.4	H
2.170	9.8	60.5	41.9	32.2	1.8	-43.9	0.0	0.0	50.6	32.1	74.0	54.0	-23.4	-21.9	H
2.604	9.8	54.8	36.3	32.8	2.0	-43.8	0.0	0.0	45.8	27.2	74.0	54.0	-28.2	-26.8	H
3.038	9.8	61.7	43.1	33.4	2.2	-43.8	0.0	0.0	53.4	34.8	74.0	54.0	-20.6	-19.2	H
3.471	9.8	69.2	50.6	33.5	2.3	-44.0	0.0	0.0	61.0	42.5	74.0	54.0	-13.0	-11.5	H
3.905	9.8	65.9	47.3	33.7	2.5	-44.2	0.0	0.0	57.8	39.3	74.0	54.0	-16.2	-14.7	H
4.339	9.8	68.1	49.5	34.0	2.7	-44.6	0.0	0.0	60.2	41.7	74.0	54.0	-13.8	-12.3	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

## END OF REPORT