



FCC PART 15 SUBPART C

CERTIFICATION REPORT

FOR

433.92 MHz TIRE MONITORING SYSTEM SENSOR

MODEL: 200.0101

FCC ID NO: NATTX433CS-2

REPORT NO: 03U1767-1

ISSUE DATE: FEBUARY 19, 2003

Prepared for

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

Prepared by

COMPLIANCE ENGINEERING SERVICES, INC.

d.b.a.

COMPLIANCE CERTIFICATION SERVICES

**561F MONTEREY ROAD
MORGAN HILL, CA 95037 USA
TEL: (408) 463-0885
FAX: (408) 463-0888**

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- Radiated Emission Worksheet for Peak Measurement
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- EUT Photographs

1. VERIFICATION OF COMPLIANCE

COMPANY NAME : SMARTIRE SYSTEMS INC.
#150 13151 VANIER PLACE
RICHMOND BC, CANADA
EUT DESCRIPTION : 433.92 MHz TIRE MONITORING SYSTEM SENSOR
MODEL NO : 200.0101
FCC ID : NATTX433CS-2
DATE TESTED : 2-19-2003
REPORT NUMBER : 03U1767-1

TYPE OF EQUIPMENT	TIRE MONITORING SYSTEM SENSOR
EQUIPMENT TYPE	433.92MHz, TIRE MONITORING SYSTEM SENSOR
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:



CHIN PANG
EMC TECHNICIAN
COMPLIANCE CERTIFICATION SERVICES

Approved & Released By:



THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

2. PRODUCT DESCRIPTION

Fundamental Frequency	433.92 MHz
Power Source	3V Battery
Transmitting	10 Packet every 4 to 6 minutes
Associated Receiver	NA
Manufacturer	SMARTIRE SYSTEMS INC.

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

Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
SA Display Section 3	HP	85662A	2314A04793	4/16/03
SA RF Section, 1.5 GHz	HP	85680A	2314A02604	11/26/03
Quasi-Peak Adapter	HP	85650A	2521A01638	4/16/03
Antenna, Log Periodic 200 ~ 1000 MHz	EMCO	3146	9107-3163	3/29/03
SA Display Section 1	HP	85662A	3026A19146	5/23/03
Spectrum Analyzer (100Hz-22GHz)	HP	8566B	2140A01296	5/23/03
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6739	1/31/03
Preamplifier, 1 ~ 26 GHz	Miteq	NSP10023988	646456	4/26/03
High Pass Filter 1.5-18GHz	Micro-Tronics	HPM13193	1	N.C.R
Preamplifier, 0.1-1300MHz	HP	8447D	2944A06550	8/22/03

7. POWERLINE RFI LIMIT

CONNECTED TO AC POWER LINE	SECTION 15.207
CARRIER CURRENT SYSTEM IN THE FREQUENCY RANGE OF 450 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

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)(e)

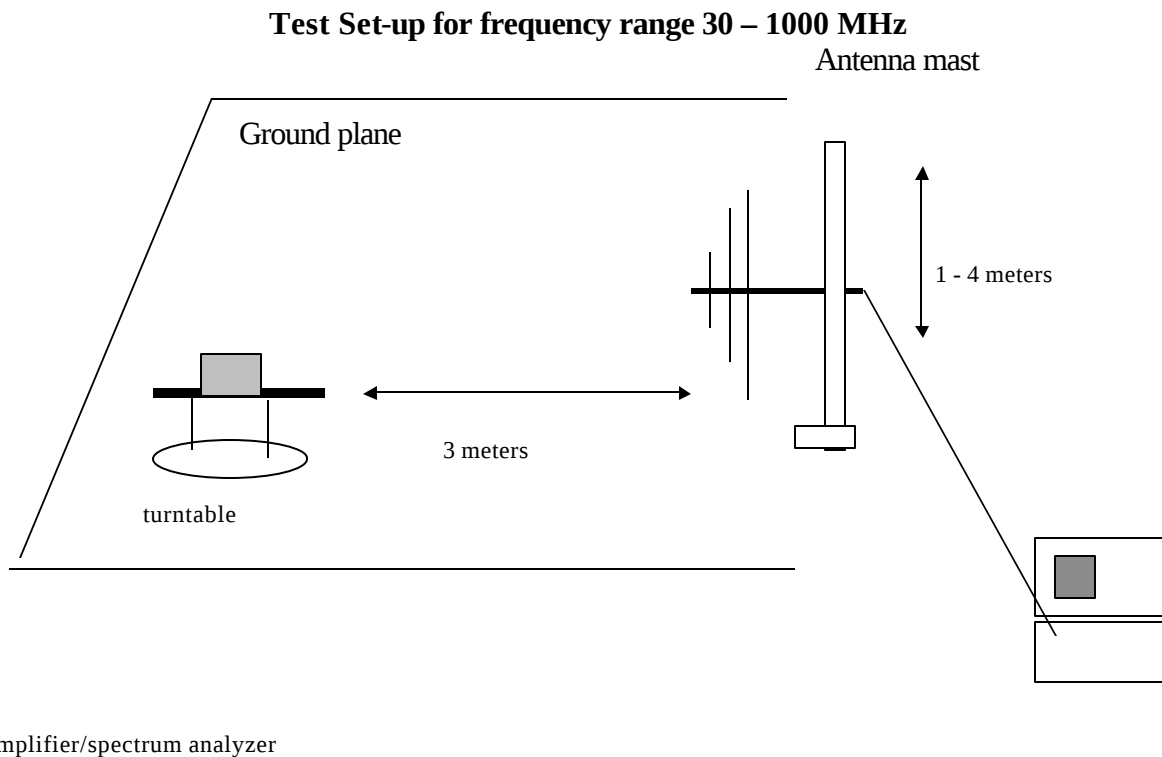
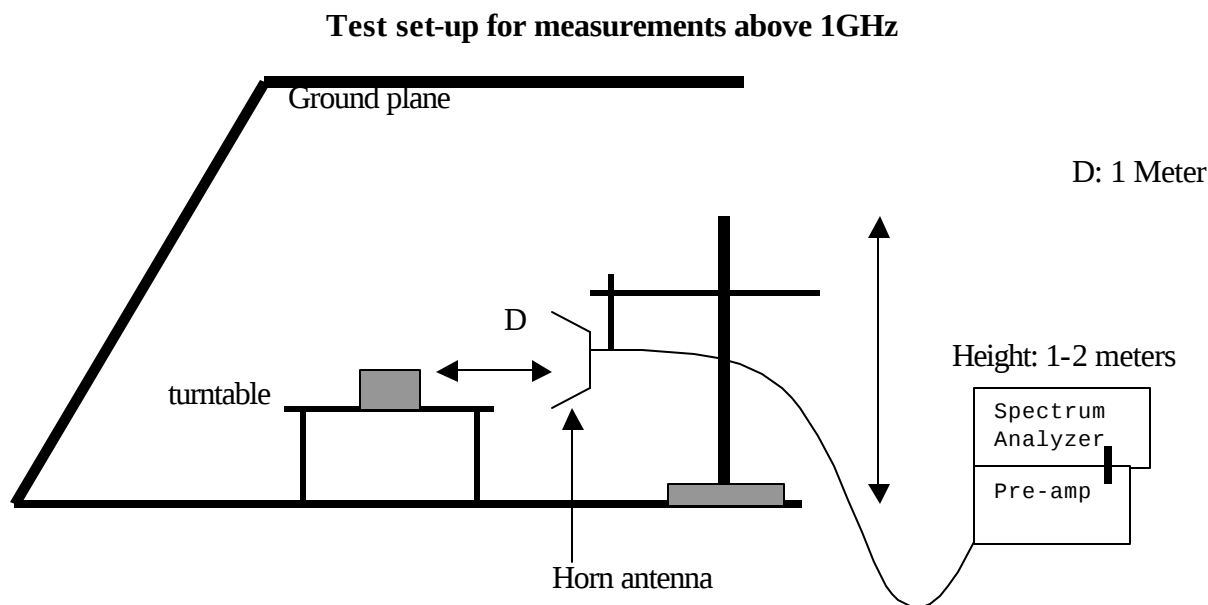


Fig. 1

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.



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 (b)	
		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	= 53.5 ms
Longer pulse	= 0.45 ms
Long Pulse	=0.300ms
Short pulse	=0.150 ms
No of Longer Pulse	=1
No of Long pulse	= 11
No of Short pulse	= 32

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

Duty Cycle = ((1x0.45)+(11x0.300)+(32x0.15))/53.5=0.1598=15.98%

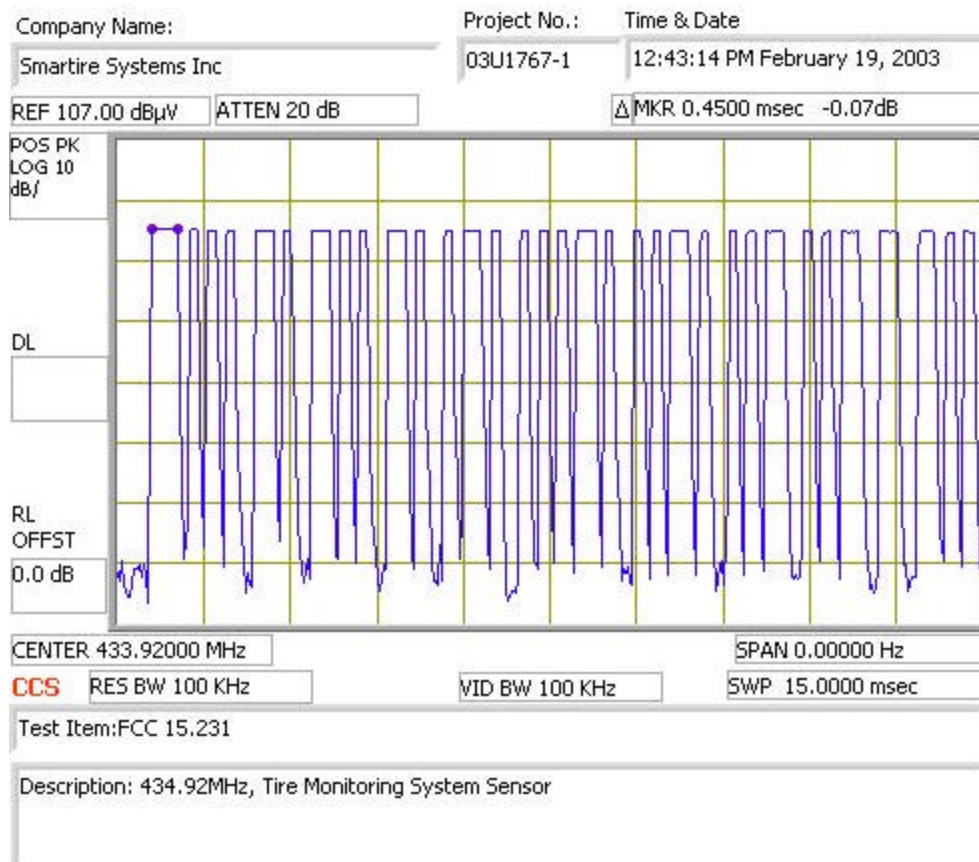
For duty cycle refer to plot #1, 2, 3,4, 5.

12.2 EMISSION BANDWIDTH

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

Center Frequency	Measured	Limits
433.92 MHz	425 KHz (refer to plot)	433.96 x 0.25%= 1.0849MHz

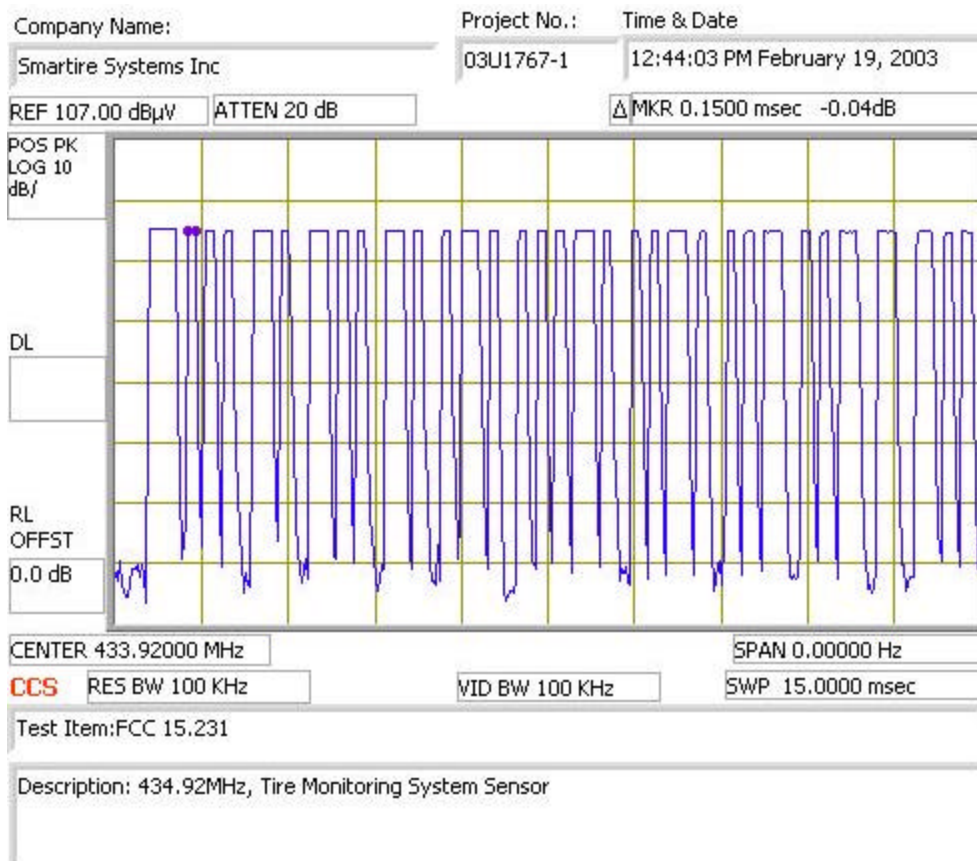
DUTY CYCLE 1



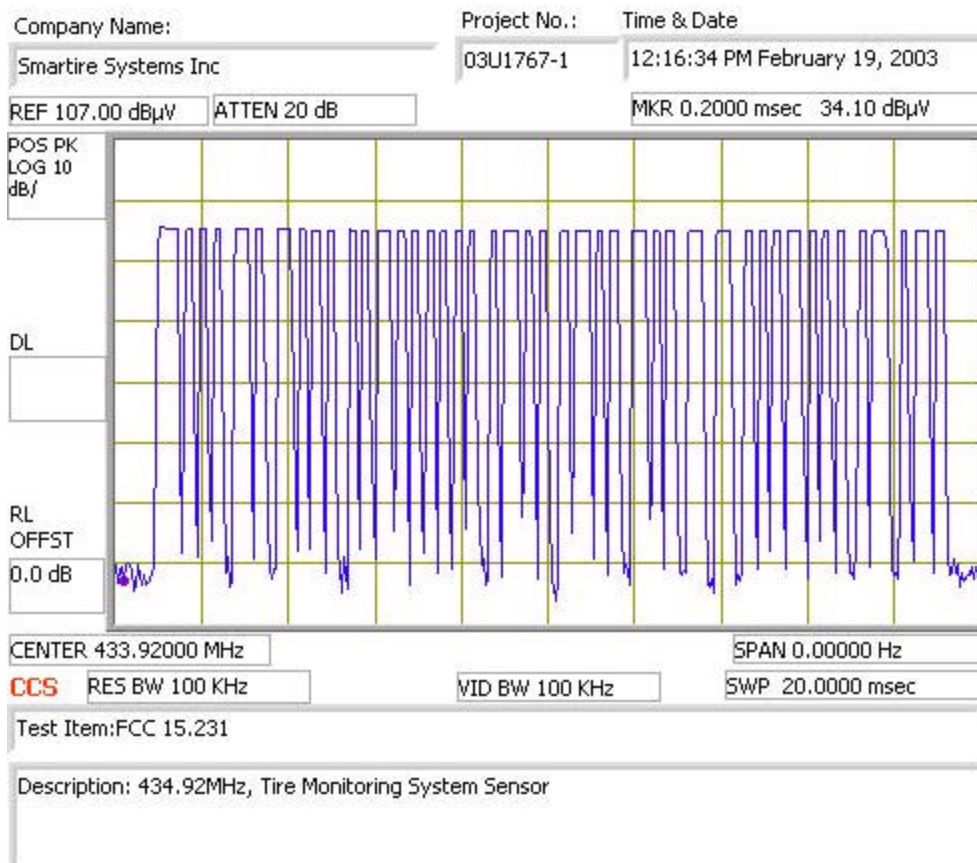
DUTY CYCLE 2



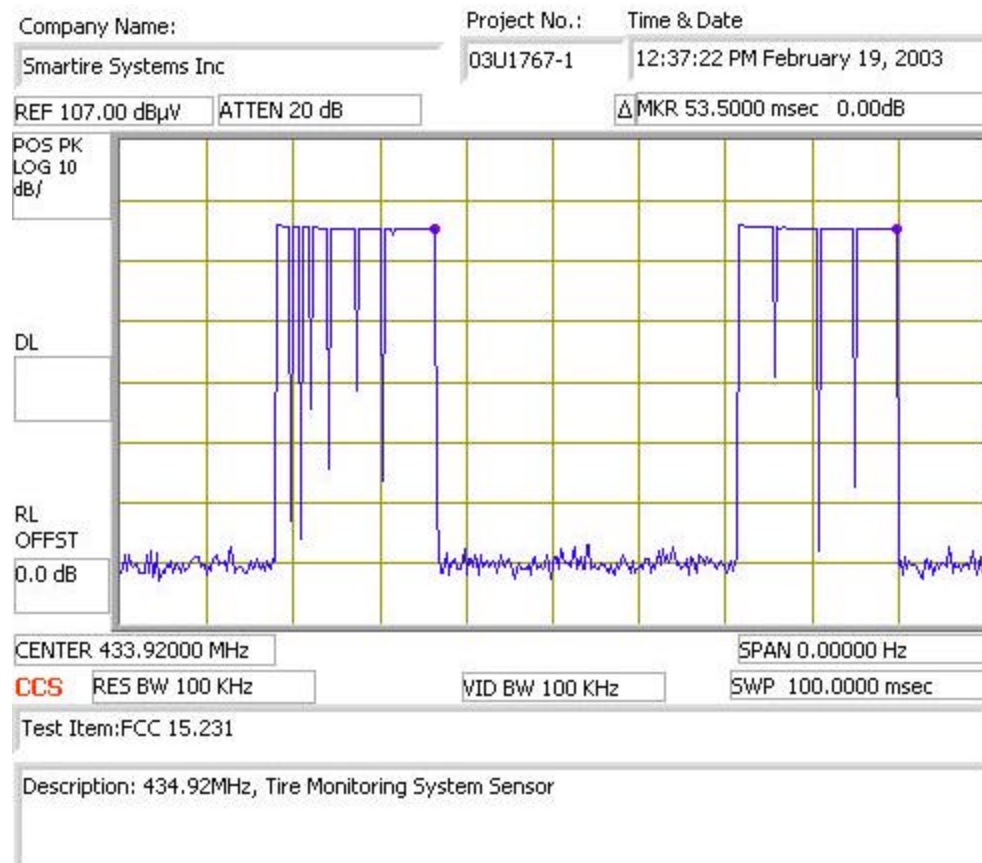
DUTY CYCLE 3



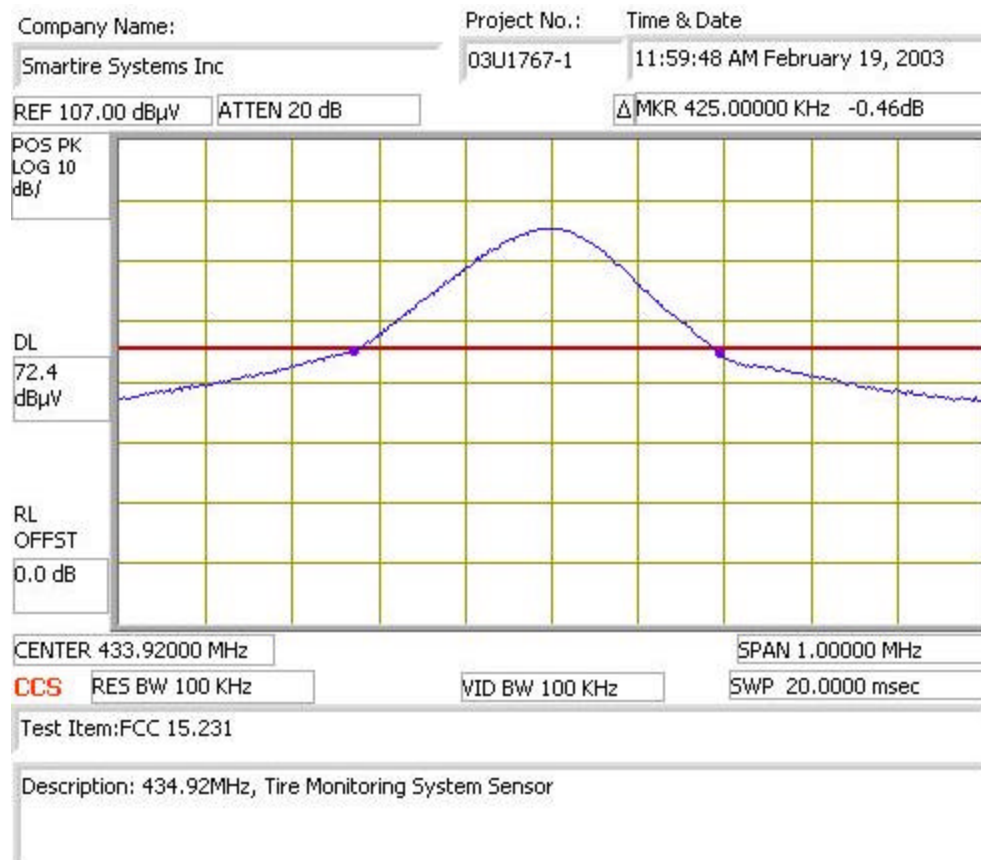
DUTY CYCLE 4



DUTY CYCLE 5



EMISSION BANDWIDTH



RADIATED DATA

							Project #: 03U1767-1 Report #: 030219C1 Date & Time: 02/19/03 10:49 AM Test Engr: 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													
Company: Smartire Systems Inc EUT Description: 433.92MHz Tire Monitoring System Sensor Test Configuration: EUT only Type of Test: FCC 15.231 Mode of Operation: Transmitting													

M% = ((t1+t2+t3+...)/T)*53.5% = 15.98%

RBW=100KHz, VBW=100KHz

Av Reading = Pk Reading + 20*log(M%)

20*log(M%) = -15.93

Freq.	Pk Rdg	Av Rdg	AF	Closs	Pre-amp	Level	Limit	Margin	Pol	Az	Height	Mark
(MHz)	(dBuV)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	FCC B	(dB)	(H/V)	(Deg)	(Meter)	(P/Q/A)
433.92Mhz Fundamental frequency												
Y-Position (stand Up)												
433.92	89.70	73.77	16.35	3.72	27.27	66.57	72.86	-6.29	3mV	0.00	1.00	P
433.92	84.00	68.07	16.35	3.72	27.27	60.87	72.86	-11.99	3mH	0.00	1.00	P
X-Position (EUT Lay Down)												
433.92	87.20	71.27	16.35	3.72	27.27	64.07	72.86	-8.79	3mV	0.00	1.00	P
433.92	86.90	70.97	16.35	3.72	27.27	63.77	72.86	-9.09	3mH	0.00	2.00	P
Z-Position (EUT Place Side Way)												
433.92	84.60	68.67	16.35	3.72	27.27	61.47	72.86	-11.39	3mV	0.00	2.50	P
433.92	89.40	73.47	16.35	3.72	27.27	66.27	72.86	-6.59	3mH	0.00	2.50	P
The Data show Y-Position is the worst case												
868.60	49.40	33.47	22.25	5.60	27.37	33.95	52.86	-18.91	3mV	0.00	2.00	P
868.60	49.10	33.17	22.25	5.60	27.37	33.65	52.86	-19.21	3mH	0.00	2.00	P

RADIATED EMISSIONS (HARMONIC)

02/19/03 High Frequency Measurement

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Chin Pang

Project #: 03U1767-1

Company: Smartire Systems Inc

EUT Descrp.: 433.92MHz Tire Monitoring System Sensor

EUT M/N: 200.0101 (FCC ID: NATTX433CS-2)

Test Target: FCC 15.231

Mode Oper: TX

Test Equipment:

Cable (feet)	EMCO Horn 1-18GHz	Pre-amplifier 1-26GHz	Spectrum Analyzer	Horn > 18GHz
15	T72; S/N: 6739	Miteda NSP2600-44	8566B Analyzer	

Peak Measurements:

1 MHz Resolution Bandwidth

1MHz Video Bandwidth

Average=Peak-Duty Cycle

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
1.301	3.3	79.4	63.5	25.2	2.8	-36.5	-9.5	0.0	61.4	45.5	74.0	54.0	-12.6	-8.5	V
1.735	3.3	79.2	63.3	26.7	3.3	-36.4	-9.5	1.0	64.3	48.4	74.0	54.0	-9.7	-5.6	V
2.169	3.3	66.5	50.6	28.3	3.7	-36.4	-9.5	1.0	53.6	37.7	74.0	54.0	-20.4	-16.3	V
2.603	3.3	57.9	42.0	29.5	4.0	-36.3	-9.5	1.0	46.6	30.6	74.0	54.0	-27.4	-23.4	V
3.037	3.3	64.0	48.1	31.1	4.2	-36.2	-9.5	1.0	54.6	38.7	74.0	54.0	-19.4	-15.3	V
3.471	3.3	67.5	51.6	32.1	4.6	-36.2	-9.5	1.0	59.6	43.7	74.0	54.0	-14.4	-10.3	V
3.905	3.3	70.1	54.2	33.1	5.0	-36.1	-9.5	1.0	63.6	47.6	74.0	54.0	-10.4	-6.4	V
4.339	3.3	71.5	55.6	33.0	5.4	-36.1	-9.5	1.0	65.3	49.4	74.0	54.0	-8.7	-4.6	V
1.301	3.3	73.3	57.4	25.2	2.8	-36.5	-9.5	0.0	55.3	39.4	74.0	54.0	-18.7	-14.6	H
1.735	3.3	71.6	55.7	26.7	3.3	-36.4	-9.5	1.0	56.7	40.8	74.0	54.0	-17.3	-13.2	H
2.169	3.3	72.1	56.2	28.3	3.7	-36.4	-9.5	1.0	59.2	43.3	74.0	54.0	-14.8	-10.7	H
2.603	3.3	62.9	47.0	29.5	4.0	-36.3	-9.5	1.0	51.6	35.6	74.0	54.0	-22.4	-18.4	H
3.037	3.3	65.9	50.0	31.1	4.2	-36.2	-9.5	1.0	56.5	40.6	74.0	54.0	-17.5	-13.4	H
3.471	3.3	73.6	57.7	32.1	4.6	-36.2	-9.5	1.0	65.7	49.8	74.0	54.0	-8.3	-4.2	H
3.905	3.3	68.3	52.4	33.1	5.0	-36.1	-9.5	1.0	61.8	45.8	74.0	54.0	-12.2	-8.2	H
4.339	3.3	73.5	57.6	33.0	5.4	-36.1	-9.5	1.0	67.3	51.4	74.0	54.0	-6.7	-2.6	H

f Measurement Frequency

Dist Distance to Antenna

Read Analyzer Reading

AF Antenna Factor

CL Cable Loss

Amp Preamp Gain

D Corr Distance Correct to 3 meters

Avg Average Field Strength @ 3 m

Peak Calculated Peak Field Strength

HPF High Pass Filter

Avg Lim Average Field Strength Limit

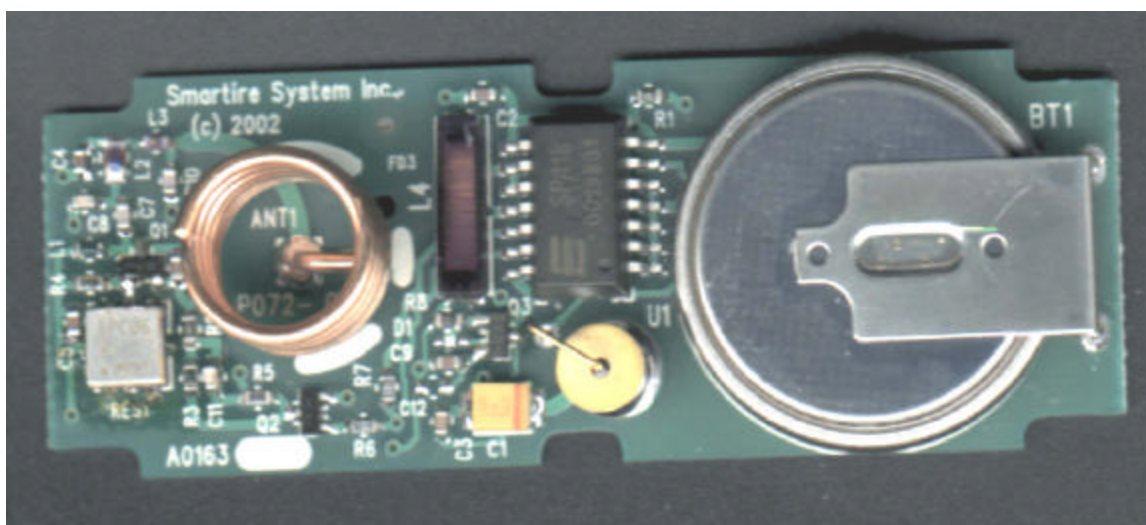
Pk Lim Peak Field Strength Limit

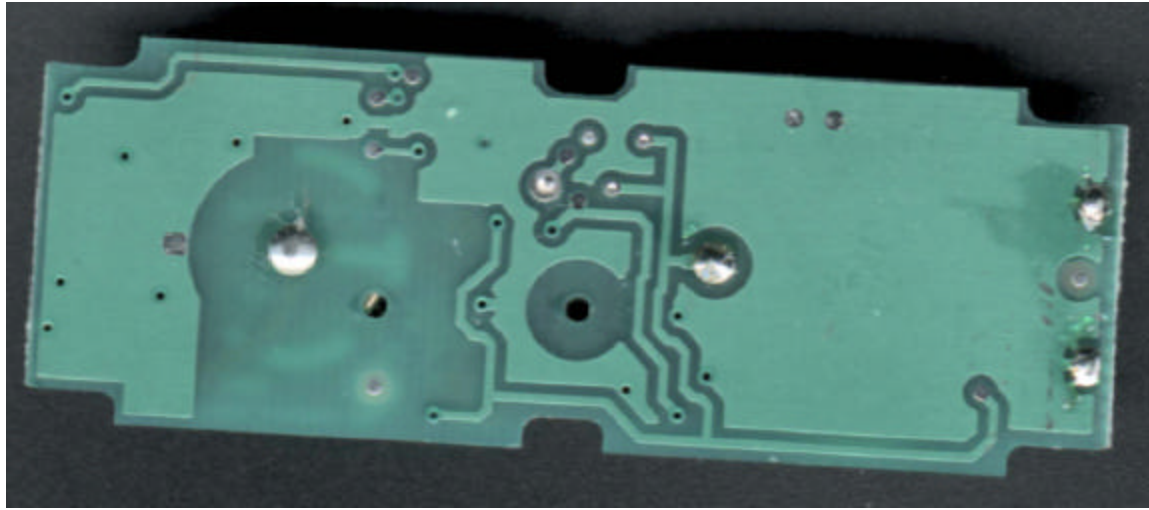
Avg Mar Margin vs. Average Limit

Pk Mar Margin vs. Peak Limit

EUT PHOTOGRAPHS







END OF REPORT