

# ***SMARTIRE SYSTEMS, INC***

## ***GEN II SUPERHETERODYNE RECEIVER***

***FCC ID: NATBR433BP***

### ***REPORT OF MEASUREMENTS PER***

***CFR TITLE 47, PART 15.109***

Revision 1.0

May 25, 2000

|              |                        |          |
|--------------|------------------------|----------|
| Prepared by: | R.E.Stirling           | 05/31/00 |
|              | Robert Stirling, P.Eng | Date     |

Protocol Labs, Abbotsford B.C., Canada  
FCC Registration Number 96437  
Industry Canada Registration Number IC3384

### **Testing Details:**

TESTED BY: Robert Stirling, P.Eng

TEST CONDITIONS: Temperature and Humidity: 20 C, 40%

TEST VOLTAGE: 120 VAC, 60 Hz

### **Test Equipment List:**

| Device             | Model Number           | Serial No. | Last Cal. | Next Cal |
|--------------------|------------------------|------------|-----------|----------|
| Antenna            | EMCO 3141 Bilog        | 1127       | 12/18/98  | 06/18/00 |
| Antenna            | EMCO 3105 Horn         | 2024       | 04/03/99  | 04/03/00 |
| LISN               | Solar 8012-50-R-24-BNC | 863092     | 02/18/00  | 02/18/01 |
| Spectrum Analyzer  | Hewlett Packard 8566B  | 2241A02102 | 12/21/99  | 12/21/00 |
| RF-Preselector     | Hewlett Packard 85685A | 3107A01222 | 12/21/99  | 12/21/00 |
| Quasi-Peak Adapter | Hewlett Packard 85650A | 2043A00240 | 12/21/99  | 12/21/00 |
| Tower              | Rhientech Labs         | Custom     |           |          |
| Turntable          | Protocol               | Custom     |           |          |

### **Equipment Under Test:**

#### **EUT**

#### **Superheterodyne Receiver**

Manufacturer SmarTire Systems, Inc.  
Model Number : 210.0129  
Serial Number ENG 01

#### **POWER SOURCE:**

#### **DC Power Supply**

Manufacturer BK Precision  
Part Number 1610A

#### **ADDITIONAL MODULES:**

#### **LCD Panel Option**

Manufacturer SmarTire Systems, Inc.  
Model Number : A130.44  
Serial Number ENG 02

The EUT is a 433.35 MHz receiver used in the SmarTire Passenger Car Tire Monitoring system. The receiver would be installed in a passenger vehicle and used to receive signals and display status of passenger tire pressure sensors installed on the wheels. A transmitter and sensor would be installed within the tire on each of the four wheels of a passenger car. With each transmitter reporting back to the Receiver once per minute for with pressure status and once every minute and a half with temperature status or approximately every thirty seconds while the vehicle is in motion at speeds in excess of ten miles per hour.

No modifications were required prior to the final radiated emissions measurements reported herein.

## **Summary of Testing:**

TEST: FIELD STRENGTH OF RADIATED EMISSIONS

SETUP: The equipment under test (EUT) was configured and operated in accordance with the applicable provisions of ANSI 063.4-1992, Section 6, 12. Measurements were made in accordance with applicable paragraphs of Section 8.2.2 and 8.2.3, Section 12.1.1.1 Appendix D, Section 12.1.4 and Appendix H3 and H4.

The EUT was placed on a 1 by 1.5 meter table located 80 cm above a 2 meter diameter non-metallic turntable that sits 40 cm above the OATS ground. A bilog- antenna was mounted on a tower spaced at a three meters distance, and arranged for adjustment in height (1-4 meters) and vertical/horizontal polarization to maximize the emissions levels when combined with turntable rotation of the EUT. The dual ridged guide antenna was mounted on a tripod at one meter height and adjusted for vertical or horizontal antenna orientation. An HP 8566B spectrum analyzer with an HP 85685A RF-Preselector, and HP 85650A Quasi-Peak Adapter were used for all measurements.

The EUT configuration is detailed in the photographs included with this report.

MEASUREMENT DETAILS: Measurements were made with the EUT receiver operating on its nominal 433.35 (+1-.1)MHz. Preliminary measurements were made as described in Section 8.3.11 and 13.1.4.1 with the receiver operating as described. During preliminary measurements only four emissions were detected with the Bilog Antenna. The higher harmonics were detected using the Double Ridge Horn Antenna, which were observed just above the noise floor at 1 meter spacing.

The final set of measurements as specified in Section 8.3.1.2 and 13.1.4.2 were made as specified in Section 13.1.1. The receiver was observed while positioned in three mutually orthogonal planes. The EUT 12 VDC power cord and the receivers attached wire antenna were manipulated to different positions endeavoring to maximize the measured levels. The EUT was 12 VDC powered from the noted external power supply during all of the measurements. RBW and VBW of 100 kHz was used for measurements below 1 GHz. Above 1 GHz peak measurements were made with a RBW and VBW of 1 MHz.

Measurements were made over the frequency range of 30 - 5000 MHz from the base model and with the LCD Module attached, with only two emissions measurable at three meters and reported below. The fundamental and the second harmonic were the only emissions measurable at three meters during the final detailed radiated emissions measurements. The third and fourth harmonics were just measurable above the noise floor at 1 meter spacing and 100 kHz RBW however, not measurable at three meters.

**NOTE:** No receiver antenna conducted emissions measurements were made as the EUT has a permanently attached wire antenna so we were unable to directly connect the spectrum analyzer to the receiver to record the antenna conducted spurious emissions.

EMISSIONS DATA: See Tables 1 and 2 for corresponding frequencies.

Product Radiated Emissions Measurements by Frequency:

Table 1 Base Unit

| Freg MHz | Vert Signal (dBm) | Horz Signal (dBm) | Cable&Antenna Losses (dB) | Vert Emission (dBuV/m) | Horz Emission (dBuV/m) | Worst Delta Limit (dB) | Limit @ 3 M (uV/m / dBuV/m) |
|----------|-------------------|-------------------|---------------------------|------------------------|------------------------|------------------------|-----------------------------|
| 433.35   | -90.0             | -92.2             | 21.6                      | 38.6                   | 36.4                   | - 7.4                  | 200/46.0                    |
| 866.67   | -101.4            | -103.7            | 30.7                      | 36.3                   | 34.0                   | - 9.7                  | 200/46.0                    |

Table 2 Base unit with LCD Panel Option

| Freg MHz | Vert Signal (dBm) | Horz Signal (dBm) | Cable&Antenna Losses (dB) | Vert Emission (dBuV/m) | Horz Emission (dBuV/m) | Worst Delta Limit (dB) | Limit @ 3 M (uV/m / dBuV/m) |
|----------|-------------------|-------------------|---------------------------|------------------------|------------------------|------------------------|-----------------------------|
| 433.35   | -90.1             | -90.5             | 21.6                      | 38.5                   | 38.1                   | - 7.5                  | 200/46.0                    |
| 866.67   | -100.9            | -100.0            | 30.7                      | 36.8                   | 37.7                   | - 8.3                  | 200/46.0                    |

PERFORMANCE: Both Versions Comply

CONCLUSION: The SmarTire Systems, Inc., FCC ID: NATBR433BP, when operated and measured as discussed above, meets the receiver radiated spurious emissions requirements under Title 47, CFR Part 15.109(a).

**This receiver is not subject to the transition provisions of Part 15.37.**