
Project Number: 05419-10

Prepared for:

Spectrum Management, LLC
2545 Tarpley Rd.
Carrollton TX 75006

By

Professional Testing (EMI), Inc.
1601 FM 1460, Suite B
Round Rock, Texas 78664

May 2005

CERTIFICATION

**Electromagnetic Interference Test Report
Spectrum Management, LLC
TracPac V LPRS Transmitter**

Table of Contents

Title Page	1
Table of Contents	2
Certificate of Compliance	3
1.0 EUT Description	4
1.1 Applicable Documents	4
1.2 EUT Operation	4
1.3 Electromagnetic Emissions Testing	4
2.0 Peak Power	5
2.1 Test Procedure	5
2.2 Test Criteria	5
2.3 Test Results	5
3.0 Occupied Bandwidth Measurements	5
3.1 Test Procedure	5
3.2 Test Criteria	5
3.3 Test Results	6
4.0 Frequency Stability	6
4.1 Test Procedure	6
4.2 Test Criteria	6
4.3 Test Results	6
5.0 Modulation Characteristics	6
5.1 Test Procedure	6
5.2 Test Criteria	6
5.3 Test Results	6
6.0 Spurious Emissions	7
6.1 Test Procedure	7
6.2 Test Criteria	7
6.3 Test Results	7
7.0 Modifications to Equipment	7
8.0 List of Test Equipment	8
FIGURES	
Figure 1 Radiated Emissions Test Setup	9
APPENDICES	
Appendix A Data Tables and Plots	10

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF PROFESSIONAL TESTING (EMI), INC.



Certificate Of Compliance

Applicant: Spectrum Management, LLC
Applicant's Address: 2545 Tarpley Rd.
Carrollton TX 75006
FCC ID: NBI-MTAG216V
Project Number: 05419-10
Test Dates: March-April, 2005

I, Michael A. Royer, for Professional Testing (EMI), Inc., being familiar with the FCC rules and test procedures have reviewed the test setup, measured data and this report. I believe them to be true and accurate.

The **Spectrum Management, LLC, TracPac V LPRS Transmitter** was tested to and found to be in compliance with FCC Part 95 for an Intentional Radiator.

The highest emissions generated by the above equipment are listed below:

	<u>Frequency (MHz)</u>	<u>Level (dBm)</u>	<u>Limit (dBm)</u>	<u>Margin (dB)</u>
Fundamental	216	18.9	20	-1.1
Spurious/Harmonics	434	-46.6	-13	-33.6
Occupied Bandwidth	10.15 (kHz)			
Frequency Stability	50 ppm			
Modulation Depth	58.2% AM			
Emission Designator	900HA1D			

Michael A. Royer, BSEE, NCE
EMC Department Manager

This report has been reviewed and accepted by Xanboo/Core Technologies. The undersigned is responsible for ensuring that **Spectrum Management, LLC, TracPac V LPRS Transmitter** will continue to comply with the FCC rules.

1.0 EUT Description

The device described in this document is intended to operate as a tracking device to pinpoint stolen valuables. It is to transmit a VHF signal, which is amplitude-modulated with vital information pertaining to the transmitter itself.

The system tested consisted of the following:

Manufacturer & Model	FCC ID Number	Description
Spectrum Management, LLC TracPac V	NBI-MTAG216V	LPRS Transmitter

1.1 Applicable Documents

Guidelines	FCC Procedure Rule Part	FCC Criteria Rule Part
Peak Power	2.1046	95.639(e)
Modulation Characteristics	2.1047	N/A
Occupied Bandwidth	2.1049	95.633(d)(2)
Spurious Radiation	2.1053	95.635(c)(1)
Frequency Stability	2.1055	95.629(b)(2)

1.2 EUT Operation

The EUT was operated in continuous transmit mode at max power to measure fundamental, harmonics, occupied bandwidth, modulation characteristics, frequency stability, and spurious radiation.

1.3 Electromagnetic Emissions Testing

Professional Testing (EMI), Inc. (PTI), follows the guidelines of NIST for all uncertainty calculations, estimates and expressions thereof for EMC testing. Measurements of the maximum emission levels for the fundamental and the spurious/harmonic emissions of the TracPac V LPRS Transmitter were made at the Professional Testing "Open Field" Site 3, located in , Texas to determine the radio noise radiated from the EUT. A "Description of Measurement Facilities" has been submitted to the FCC and approved pursuant to Section 2.948 of CFR 47 of the FCC rules.

2.0 Peak Power

Measurements of Peak Power for the fundamental signals were made at Professional Testing Round Rock, Texas site.

2.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a motorized turntable which allows 360 degree rotation. For measurements of the fundamental signal, a measurement antenna was positioned at a distance of 3 meters as measured from the closest point of the EUT. The radiated emissions were maximized by rotating the EUT. The device was tested in three orthogonal axis to determine worst case orientation. A Spectrum Analyzer with peak detection was used to find the maximums of the radiated emissions during testing. A drawing showing the test setup is given as Figure 1.

The antenna substitution method was then employed to determine the ERP of the device. The EUT was replaced with a dipole connected to a signal generator and tuned to the frequency of emission. The amplitude on the signal generator was set so that the field strength measured is equivalent to the fundamental emission. The substitution dipole and the measurement antenna are polarized to match the measured emission. The cable loss and dipole gain are then used to calculate the peak power of the EUT.

2.2 Test Criteria

The peak radiated power of an LPRS transmitter shall not exceed 100 mW or 20 dBm as stated in 95.639(e)

2.3 Test Results

The EUT exhibited a peak ERP of 18.9 dBm. The EUT is compliant with section 95.639(e).

3.0 Occupied Bandwidth Measurements

Measurements of the occupied bandwidth for the fundamental signals were made at Professional Testing Round Rock, Texas site.

3.1 Test Procedure

The procedure stated in section 2.1049 is used to measure occupied bandwidth. The occupied bandwidth was based on a 20 dB criteria (20 dB down either side of the emission from the peak emission).

3.2 Test Criteria

According to section 95.633(d)(2) the authorized bandwidth for the EUT is 25 kHz.

3.3 Test Results

The EUT had a maximum occupied bandwidth of 10.15 kHz. The EUT is compliant with section 95.633(d)(2).

4.0 Frequency Stability

Measurements of Frequency Stability for the fundamental signals were made at Professional Testing Round Rock, Texas site. All measurements were made in a Tenney T40RS climate chamber.

4.1 Test Procedure

The procedure stated in section 2.1055 was used to perform frequency stability measurements.

4.2 Test Criteria

Section 95.629(b)(2) states that the frequency stability should be maintained within 50 ppm.

4.3 Test Results

All test points exhibited a frequency error of less than 50 ppm therefore the EUT is compliant to section 95.629(b)(2).

5.0 Modulation Characteristics

Measurements of Modulation Depth were performed at Professional Testing Round Rock, Texas site. All measurements were made in a controlled environment in a configuration which did not present measurement distortion or ambient interference.

5.1 Test Procedure

The EUT was powered normally in ambient conditions while transmitting normally. An HP 8901A Modulation Analyzer is calibrated using its self calibration routine. A loop probe was connected to the modulation analyzer and the analyzer tuned to the frequency of the transmitter. The amount of Amplitude Modulation is read on the display of the Modulation Analyzer.

5.2 Test Criteria

There is no criterion associated with the LPRS transmitter.

5.3 Test Results

The EUT exhibited 58.2% Amplitude Modulation at its peak.

6.0 Spurious Emissions

Measurements of spurious and harmonic emissions were performed at Professional Testing Round Rock, Texas site.

6.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a motorized turntable which allows 360 degree rotation. For measurements of the fundamental signal, a measurement antenna was positioned at a distance of 3 meters as measured from the closest point of the EUT. For spurious/harmonic measurements above 1 GHz, the measurement antenna was placed 3 meters from the EUT. The radiated emissions were maximized by rotating the EUT. A Spectrum Analyzer with peak detection was used to find the maximums of the radiated emissions during the variability testing. A drawing showing the test setup is given as Figure 2.

The antenna substitution method was then employed to determine the E.I.R.P of the EUT's emissions. The EUT was replaced with a dipole connected to a signal generator and tuned to the frequency of emission. The amplitude on the signal generator was set so that the field strength measured is equivalent to the field strength of the EUT's emission. The substitution dipole and the measurement antenna are polarized to match the measured emission. The cable loss and dipole gain are then used to calculate the peak power of the EUT.

6.2 Test Criteria

Criteria in section 95.635(c)(1) states that the spurious emissions must be attenuated by -30 dBc from 12.5-22.5 kHz from the carrier frequency. On frequencies greater than 22.5 kHz away from the carrier must be attenuated to -13 dBm of radiated power.

6.3 Test Results

By virtue of examining the occupied bandwidth plot the EUT meets the criteria of spurious content being -30 dBc from 12.5-22.5 kHz away from the carrier. The -30 dBc points are approximately 8 kHz away from the carrier. All other spurious and harmonic content is less than -13 dBm. The EUT is therefore compliant with section 95.635(c)(1).

7.0 Modifications to Equipment

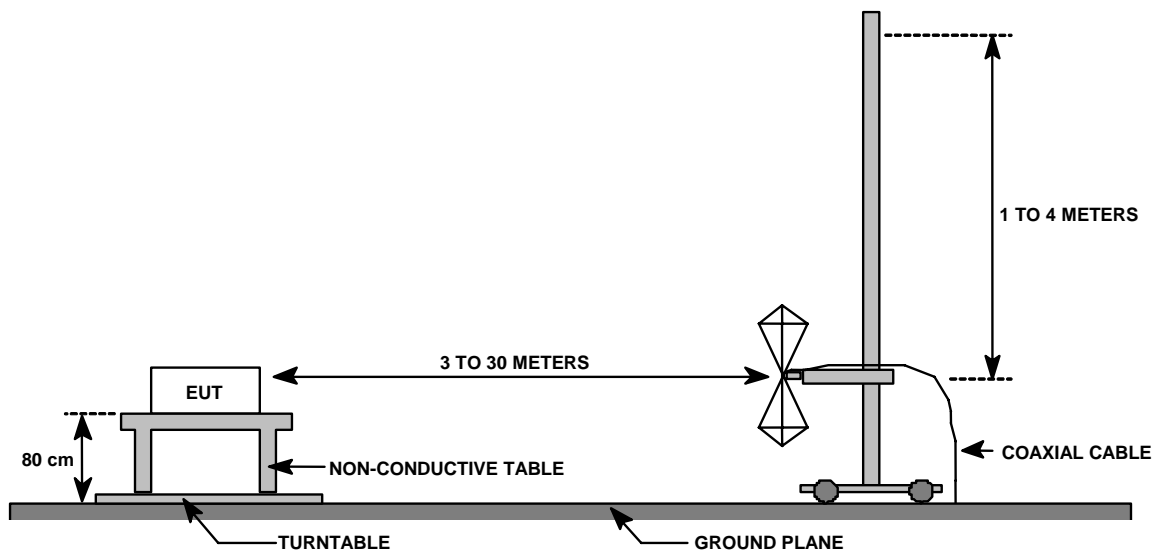
No modifications were made to the EUT.

8.0 List of Test Equipment

A list of the test equipment utilized to perform the testing is given below. The date of calibration is given for each.

<u>Device</u>	<u>Description</u>	<u>Calibration Due</u>
EMCO 3115	Horn Antenna	July 2005
MITEQ AFS4-00101800-40-10P	Preamp	July 2005
HP8566B	Spectrum Analyzer	March 2006
HP85650	Quasi-peak Adapter	March 2006
HP85685	Preselector	March 2006
Compliance Design B-100	Biconical Antenna	July 2005
EMCO 3146	Log Periodic Antenna	July 2005
HP8447D	Preamplifier	November 2005
HP8591E	Spectrum Analyzer	October 2005
HP8447F	Preamplifier	November 2005
EMCO 3108	Biconical Antenna	June 2005
EMCO 3146	Log Periodic Antenna	September 2005
Austron	Frequency Counter	CBU
HP8901A	Modulation Analyzer	CBU
EMCO 3121C	Dipole Antennas	July 2005
Gigatronics GT9000	Synthesized Signal Generator	July 2005
Tenney T40RS	Climate Chamber	October 2005

FIGURE 1: Radiated Emissions Test Setup



APPENDIX A **DATA TABLES AND PLOTS**

Peak Power Data Sheet
Spectrum Management, LLC
TracPac V LPRS Transmitter

Test Date: April 14, 2005
Measurement Distance (Meters): 3
Peak Detection
RBW =100 kHz

Channel 1

Frequency (MHz)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Antenna Polarization	Detector Function
216	89.8	0.0	11.4	4.1	105.3	Vertical	Peak
216	94.8	0.0	11.4	4.1	110.3	Horizontal	Peak

Channel 20

Frequency (MHz)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Antenna Polarization	Detector Function
216	89.1	0.0	11.4	4.1	104.6	Vertical	Peak
216	95.3	0.0	11.4	4.1	110.8	Horizontal	Peak

Channel 40

Frequency (MHz)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Antenna Polarization	Detector Function
216	90.6	0.0	11.4	4.1	106.1	Vertical	Peak
216	95.1	0.0	11.4	4.1	110.6	Horizontal	Peak

TEST ENGINEER: Jason Anderson

Peak Power Data Sheet
Spectrum Management, LLC
TracPac V LPRS Transmitter

Test Date: April 14, 2005
Measurement Distance (Meters): 3
Peak Detection
RBW =100 kHz

Substitution Data Table

Frequency (MHz)	Channel	Corrected Level (dBuV/m)	Signal Generator (dBm)	Antenna Gain (dBd)	Cable Loss (dB)	ERP (dBm)	Antenna Polarization	Detector Function
216	1	105.3	21.6	0.0	4.4	17.2	Vertical	Peak
216	1	110.3	22.5	0.0	4.4	18.1	Horizontal	Peak
216	20	104.6	20.9	0.0	4.4	16.5	Vertical	Peak
216	20	110.8	23.3	0.0	4.4	18.9	Horizontal	Peak
216	40	106.1	22.4	0.0	4.4	18.0	Vertical	Peak
216	40	110.6	23.1	0.0	4.4	18.7	Horizontal	Peak

Result: The Peak Radiated Power is 18.9 dBm or 77.6 mW.

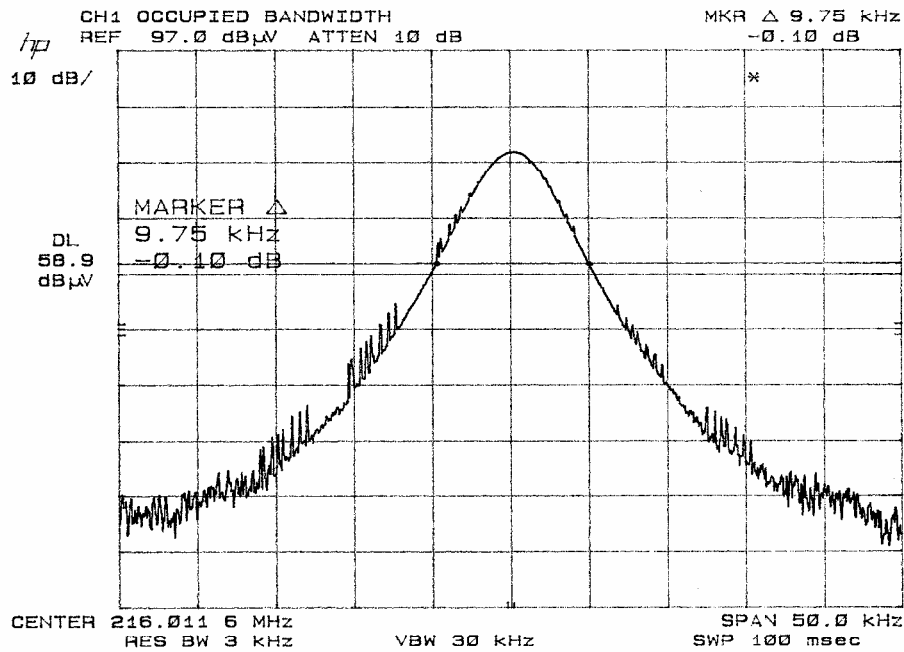
Occupied Bandwidth Data Sheets

Spectrum Management, LLC

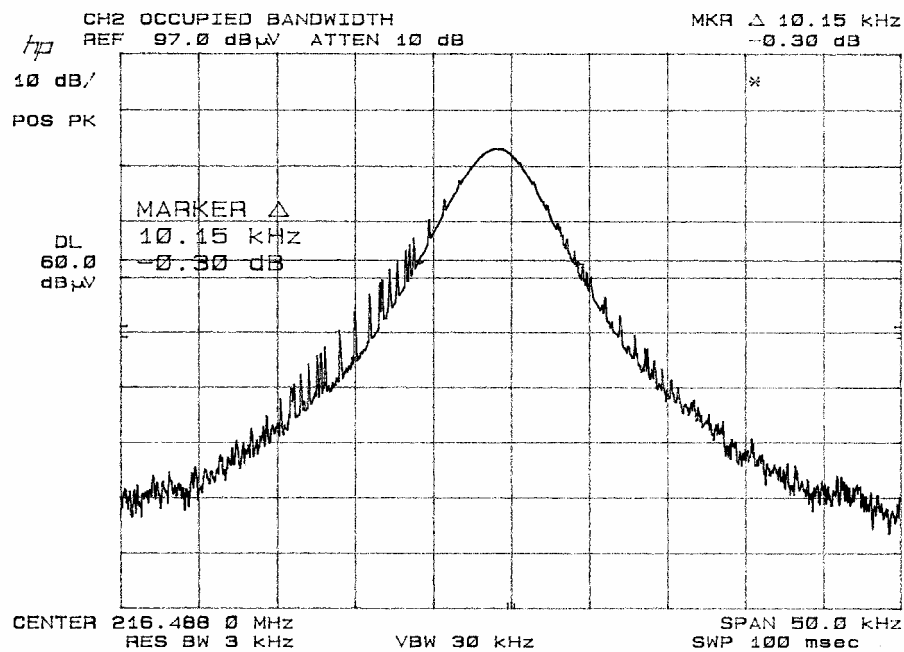
TracPac V LPRS Transmitter

Test Date: April 14, 2005
RBW =3 kHz

Channel 1

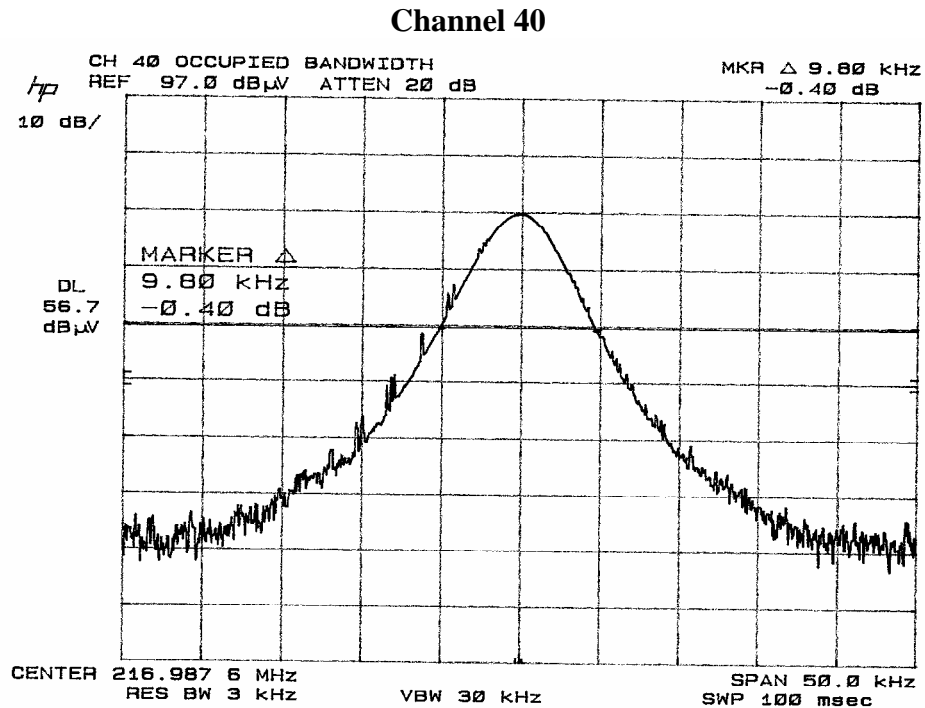


Channel 20



Occupied Bandwidth Data Sheets
Spectrum Management, LLC
TracPac V LPRS Transmitter

Test Date: April 14, 2005
RBW = 3 kHz



Frequency Stability Data Sheets
Spectrum Management, LLC
TracPac V LPRS Transmitter

Test Date: March 17, 2005

Frequency Stability

Operating Condition		Channel 01 216.012500 (MHz)	Error (ppm)	Channel 20 216.487500 (MHz)	Error (ppm)	Channel 40 216.987500 (MHz)	Error (ppm)
Normal		216.012462	0.18	216.487367	0.61	216.987693	0.89
-30° C		216.012863	1.68	216.487068	2.00	216.988536	4.77
-20° C		216.012892	1.81	216.486958	2.50	216.988602	5.08
-10° C		216.013104	2.80	216.487125	1.73	216.988382	4.06
-0° C		216.013051	2.55	216.486992	2.35	216.98823	3.36
10° C		216.013116	2.85	216.486962	2.49	216.988659	5.34
20° C		216.012796	1.37	216.487141	1.66	216.98798	2.21
30° C		216.012833	1.54	216.487144	1.64	216.98807	2.63
40° C		216.012748	1.15	216.487184	1.46	216.98808	2.67
50° C		216.012679	0.83	216.4872	1.39	216.987838	1.56
85% VDC		216.01278	1.30	216.487083	1.93	216.98804	2.49

Result: The margin of error for all conditions is less than the criteria of 50 ppm.

Spurious/Harmonic Emissions Data Sheets
Spectrum Management, LLC
TracPac V LPRS Transmitter

Test Date: April 27, 2005

Measurement Distance (Meters): 3

Peak Detection

RBW=100kHz / <1GHz RBW=1MHz / >1GHz

Channel 1

Frequency (MHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Antenna Polarization	Detector Function
432	max	level	56.8	28.0	16.3	7.2	52.4	Vertical	Peak
432	max	level	57.3	28.0	16.3	7.2	52.9	Horizontal	Peak
648	max	level	49.5	28.2	19.3	9.4	50.0	Vertical	Peak
648	max	level	54.1	28.2	19.3	9.4	54.6	Horizontal	Peak
864	max	level	43.7	28.2	21.9	10.5	47.9	Vertical	Peak
864	max	level	44	28.2	21.9	10.5	48.2	Horizontal	Peak
1080	noise	floor	47.1	27.5	23.9	3.1	46.6	Vertical	Peak
1080	noise	floor	47.1	27.5	23.9	3.1	46.6	Horizontal	Peak
1296	noise	floor	47.6	29.8	24.5	3.5	45.8	Vertical	Peak
1296	noise	floor	47.6	29.8	24.5	3.5	45.8	Horizontal	Peak
1512	noise	floor	50.1	32.0	25.3	3.8	47.1	Vertical	Peak
1512	noise	floor	50.1	32.0	25.3	3.8	47.1	Horizontal	Peak
1728	noise	floor	48	32.9	26.3	4.2	45.6	Vertical	Peak
1728	noise	floor	48	32.9	26.3	4.2	45.6	Horizontal	Peak
1944	noise	floor	48.3	33.7	27.3	4.6	46.5	Vertical	Peak
1944	noise	floor	48.3	33.7	27.3	4.6	46.5	Horizontal	Peak
2160	noise	floor	46.6	34.2	27.8	5.0	45.2	Vertical	Peak
2160	noise	floor	46.6	34.2	27.8	5.0	45.2	Horizontal	Peak

Test Engineer: Jason Anderson

Spurious/Harmonic Emissions Data Sheets
Spectrum Management, LLC
TracPac V LPRS Transmitter

Test Date: April 27, 2005

Measurement Distance (Meters): 3

Peak Detection

RBW=100kHz / <1GHz RBW=1MHz / >1GHz

Channel 20

Frequency (MHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Antenna Polarization	Detector Function
433	max	level	55.2	28.0	16.3	7.3	50.8	Vertical	Peak
433	max	level	56.4	28.0	16.3	7.3	52.0	Horizontal	Peak
649.5	max	level	46.8	28.2	19.3	9.4	47.4	Vertical	Peak
649.5	max	level	51.5	28.2	19.3	9.4	52.1	Horizontal	Peak
866	max	level	40.3	28.2	21.9	10.5	44.6	Vertical	Peak
866	max	level	43	28.2	21.9	10.5	47.3	Horizontal	Peak
1082.5	noise	floor	47.1	27.5	23.9	3.1	46.6	Vertical	Peak
1082.5	noise	floor	47.1	27.5	23.9	3.1	46.6	Horizontal	Peak
1299	noise	floor	47.6	29.8	24.5	3.5	45.8	Vertical	Peak
1299	noise	floor	47.6	29.8	24.5	3.5	45.8	Horizontal	Peak
1215.5	noise	floor	50.1	32.0	25.3	3.8	47.1	Vertical	Peak
1515.5	noise	floor	50.1	32.0	25.3	3.8	47.1	Horizontal	Peak
1732	noise	floor	48	32.9	26.3	4.2	45.6	Vertical	Peak
1732	noise	floor	48	32.9	26.3	4.2	45.6	Horizontal	Peak
1948.5	noise	floor	48.3	33.7	27.3	4.6	46.5	Vertical	Peak
1948.5	noise	floor	48.3	33.7	27.3	4.6	46.5	Horizontal	Peak
2165	noise	floor	46.6	34.2	27.8	5.0	45.2	Vertical	Peak
2165	noise	floor	46.6	34.2	27.8	5.0	45.2	Horizontal	Peak

Test Engineer: Jason Anderson

Spurious/Harmonic Emissions Data Sheets
Spectrum Management, LLC
TracPac V LPRS Transmitter

Test Date: April 27, 2005

Measurement Distance (Meters): 3

Peak Detection

RBW=100kHz / <1GHz RBW=1MHz / >1GHz

Channel 40

Frequency (MHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Antenna Polarization	Detector Function
434	max	level	56.9	28.0	16.3	7.3	52.6	Vertical	Peak
434	max	level	59.1	27.4	16.3	6.3	54.3	Horizontal	Peak
651	max	level	50.1	28.2	19.4	9.4	50.7	Vertical	Peak
651	max	level	52.6	27.1	20.4	7.9	53.8	Horizontal	Peak
868	max	level	39.7	26.2	22.9	10.3	46.8	Vertical	Peak
868	max	level	41.2	26.2	22.9	10.3	48.3	Horizontal	Peak
1085	noise	floor	47.1	27.5	23.9	3.1	46.6	Vertical	Peak
1085	noise	floor	47.1	27.5	23.9	3.1	46.6	Horizontal	Peak
1302	noise	floor	47.6	29.8	24.5	3.5	45.8	Vertical	Peak
1302	noise	floor	47.6	29.8	24.5	3.5	45.8	Horizontal	Peak
1519	noise	floor	50.1	32.0	25.3	3.8	47.1	Vertical	Peak
1519	noise	floor	50.1	32.0	25.3	3.8	47.1	Horizontal	Peak
1736	noise	floor	48	32.9	26.3	4.2	45.6	Vertical	Peak
1736	noise	floor	48	32.9	26.3	4.2	45.6	Horizontal	Peak
1953	noise	floor	48.3	33.7	27.3	4.6	46.5	Vertical	Peak
1953	noise	floor	48.3	33.7	27.3	4.6	46.5	Horizontal	Peak
2170	noise	floor	46.6	34.2	27.8	5.0	45.2	Vertical	Peak
2170	noise	floor	46.6	34.2	27.8	5.0	45.2	Horizontal	Peak

Test Engineer: Jason Anderson

Spurious/Harmonic Emissions Data Sheets
Spectrum Management, LLC
TracPac V LPRS Transmitter

Test Date: April 27, 2005

Measurement Distance (Meters): 3

Peak Detection

RBW=100kHz / <1GHz RBW=1MHz / >1GHz

Substitution Table

Frequency (MHz)	Channel	Corrected Level (dBuV/m)	Signal Generator (dBm)	Antenna Gain (dBd)	Cable Loss (dB)	ERP (dBm)	Antenna Polarization	Detector Function
432	1	52.4	-42.5	0.0	5.2	-47.7	Vertical	Peak
432	1	52.9	-42.8	0.0	5.2	-48.0	Horizontal	Peak
433	20	50.8	-44.1	0.0	5.2	-49.3	Vertical	Peak
433	20	52	-43.7	0.0	5.2	-48.9	Horizontal	Peak
434	40	52.6	-42.3	0.0	5.2	-47.5	Vertical	Peak
434	40	54.3	-41.4	0.0	5.2	-46.6	Horizontal	Peak
648	1	50	-43.5	0.0	5.8	-49.3	Vertical	Peak
648	1	54.6	-41.9	0.0	5.8	-47.7	Horizontal	Peak
649.5	20	47.4	-46.1	0.0	5.8	-51.9	Vertical	Peak
649.5	20	52.1	-44.4	0.0	5.8	-50.2	Horizontal	Peak
651	40	50.7	-42.8	0.0	5.8	-48.6	Vertical	Peak
651	40	53.7	-42.8	0.0	5.8	-48.6	Horizontal	Peak
864	1	47.9	-46.2	0.0	6.3	-52.5	Vertical	Peak
864	1	48.2	-45.4	0.0	6.3	-51.7	Horizontal	Peak
866	20	44.6	-49.5	0.0	6.3	-55.8	Vertical	Peak
866	20	47.3	-46.3	0.0	6.3	-52.6	Horizontal	Peak
868	40	46.8	-47.3	0.0	6.3	-53.6	Vertical	Peak
868	40	48.3	-45.3	0.0	6.3	-51.6	Horizontal	Peak

Note: The maximum spurious emission from the EUT is -46.6 dBm. This meets the criteria that all spurious emissions must be -13 dBm. The EUT is therefore compliant.