

Exhibit 7 – Test Report

Project Number: 02079-10

Prepared for:

SPECTRUM MANAGEMENT
2545 Tarpley Road.
Carrollton, Texas 75006

By

Professional Testing (EMI), Inc.
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November, 2001

CERTIFICATION
Electromagnetic Interference
Test Report

SPECTRUM MANAGEMENT
9 kHz Transmitter

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



Certificate of Compliance

Applicant: Spectrum Management
Applicant's Address: 2545 Tarpley Road
Carrollton, Texas 75006
Model: 9kHz Transmitter
Serial Number: 0022 & 0107
Project Number: 02079-10

I, Dale L. Reynolds, 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 9kHz Transmitter** was tested to and found to be in compliance with FCC Part 15 Subpart C for an Intentional Radiator.

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

| | <u>Frequency (kHz)</u> | <u>Level (μV/m)</u> | <u>Limit (μV/m)</u> | <u>Margin (μV)</u> |
|-------------|------------------------|------------------------------------|------------------------------------|-----------------------------------|
| Fundamental | 9.0 | 56.9 | 266.7 | -209.8 |
| Spurious | 63.0 | 1.5 | 38.1 | -36.6 |

Dale L. Reynolds
Laboratory Manager

This report has been reviewed and accepted by Spectrum Management. The undersigned is responsible for ensuring that the **9kHz Transmitter** will continue to comply with the FCC rules.

1.0 EUT Description

The Equipment Under Test (EUT) is the **Spectrum Management 9kHz Transmitter**. The **9kHz Transmitter** is a dye-pack actuation transmitter. It operates on AC power and also contains a rechargeable battery for protection during power outages. It transmits FSK codes to trigger dye-packs used for security purposes. The EUT operates at 9kHz and is designed for compliance with 47 CFR Part 15 of the FCC rules. Specific test requirements for this device include the following:

| | |
|---------------|---------------------|
| 47 CFR 15.203 | Antenna Requirement |
| 47 CFR 15.207 | Conducted Emissions |
| 47 CFR 15.209 | Radiated Emissions |

The system tested was comprised of the following components:

| <u>Manufacturer & Model</u> | <u>Serial #</u> | <u>FCC ID #</u> | <u>Description</u> |
|----------------------------------------|------------------------|------------------------|---------------------------|
| Spectrum Management, 9kHz Transmitter | 0022 & 0107 | None | 9 kHz Transmitter |

1.1 EUT Operation

The **Transmitter** communicates with a receiver by producing a time varying magnetic field. Information is transferred by frequency-shift being the carrier. The mark frequencies are 9131kHz and 8949kHz respectively. Setup and operational modes represent worst-case configuration and operating modes for the device.

2.0 Electromagnetic Emissions Testing

Professional Testing (EMI), Inc. (PTI) follows the guidelines of NIST for uncertainty calculations, estimates, and expressions thereof for EMC testing.

Fundamental and spurious radiated emissions levels for the 9 kHz transmitter were measured. Power line conducted emissions levels were also evaluated.

The radiated emissions measurements were made at the Professional Testing “Open Field” Site 3, located in Round Rock, Texas. A “Description of Measurement Facilities” has been submitted to the FCC, and approval has been received pursuant to Section 2.948 of CFR 47 of the FCC rules. Conducted emissions measurements were made in a shielded room also located at the Round Rock, Texas facility.

2.1 Test Procedure

In the radiated emissions tests, the EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a motorized turntable that allows 360-degree rotation. Antennas were positioned three meters from the nearest part of the EUT. Radiated electric emissions were maximized by rotating the EUT, raising and lowering the antenna one to

four meters, and by configuring the antenna for horizontal and vertical polarization. Magnetic emissions were maximized by rotating the loop antenna on its vertical axis.

A spectrum analyzer was used to find the maximum emissions levels during radiated emissions testing. Figures 1 and 2 contain drawings of the test equipment configurations.

The conducted emissions tests were performed to determine compliance with Part 15.107. The measurements were performed in a shielded room, using equipment and procedures specified in ANSI C63.4-1992, Section 7.

A spectrum analyzer was used to find the maximum emissions levels during conducted emissions testing. Figure 3 contains a drawing of the test equipment configuration.

2.2 Test Criteria

The table below shows FCC Part 15.209 radiated limits for an intentional radiator operating at 9kHz band. In addition to these requirements, the EUT must meet the restricted emission band requirements of §15.205. For this frequency range, the unintentional radiated emission limits of §15.109 for 9kHz radiator is higher than the restricted band limits of §15.205. The limit of §15.205 was used for the spurious emission test. The spurious measurements of the harmonic were performed to the 10th harmonic of the fundamental. The reference distance for each limit is also shown in this table.

| Frequency <u>MHz</u> | Test Distance <u>Meters</u> | Field Strength <u>(μV/m)</u> | Field Strength <u>(dBμV/m)</u> |
|-------------------------|--------------------------------|------------------------------------------------|--------------------------------------------------|
| 0.009-0.490 | 300 | 2400/F (kHz) | |
| 0.490-1.705 | 30 | 24000/F (kHz) | |
| 1.705 to 30.0 | 30 | 30 | 29.5 |
| 30 to 88 | 3 | 100 | 40.0 |
| 88 to 216 | 3 | 150 | 43.5 |
| 216 to 960 | 3 | 200 | 46.0 |
| Above 960 | 3 | 500 | 54.0 |

The FCC Part 15 Class B conduction limits is given below for conducted emissions.

| Frequency <u>(MHz)</u> | Maximum RF Line Voltage <u>(dBμV)</u> |
|---------------------------|---------------------------------------------------------|
| 0.45 to 30.0 | Quasi-Peak 48.0 |

The tighter limit shall apply at the edge between two frequency bands.

2.3 Radiated Emissions Test Results

The fundamental emissions and harmonics test data are presented in Appendices A and B.

Radiated emissions from the 9 kHz transmitter comply with the requirements of FCC Part 15.205 and FCC Part 15.209.

2.4 Conducted Emissions Test Results

Appendix C contains the conducted emissions test results.

Conducted emissions on both the Phase and Neutral lines comply with the requirements of FCC Part 15.107, Paragraph b.

3.0 Antenna Requirement

An analysis of the **9kHz Transmitter** was performed to determine compliance with Section 15.203 of the Rules. This section requires specific handling and control of antennas used for devices subject to regulations under the Intentional Radiator portions of Part 15.

3.1 Evaluation Procedure

The structure and application of the **9kHz Transmitter** were analyzed with respect to the rules. The antenna for this unit is an internal antenna, which is soldered onto the main board and is not accessible by the user. An auxiliary antenna port is not present.

3.2 Evaluation Criteria

Section 15.203 of the rules states that the subject device must meet at least one of the following criteria:

- (a) Antenna be permanently attached to the unit.
- (b) Antenna must use a unique type of connector to attach to the EUT.
- (c) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

3.3 Evaluation Results

The **9kHz Transmitter** meets the criteria of this rule by virtue of having an internal antenna permanently attached to the unit. The EUT is therefore compliant with §15.203.

4.0 Modifications to Equipment

There were no modifications made on the **9kHz Transmitter** during the performance of the test program in order to meet the FCC criteria.

5.0 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.

Electromagnetic Emissions Test Equipment

| <u>Device</u> | <u>Description</u> | <u>Calibration Due</u> |
|-------------------------|--------------------|------------------------|
| Advantest R3265 | Spectrum Analyzer | February 2002 |
| Compliance Design B-100 | Biconical Antenna | November 2001 |
| EMCO 3301B | Active Rod Antenna | March 2002 |
| Tektronix 2706 | RF Preselector | November 2001 |
| HP 8447D | Preamp | May 2002 |
| EMCO 3146 | Log Antenna | November 2001 |
| Schwartzbeck 8127 | LISN | August 2002 |

FIGURE 1 Radiated Emissions Test Setup

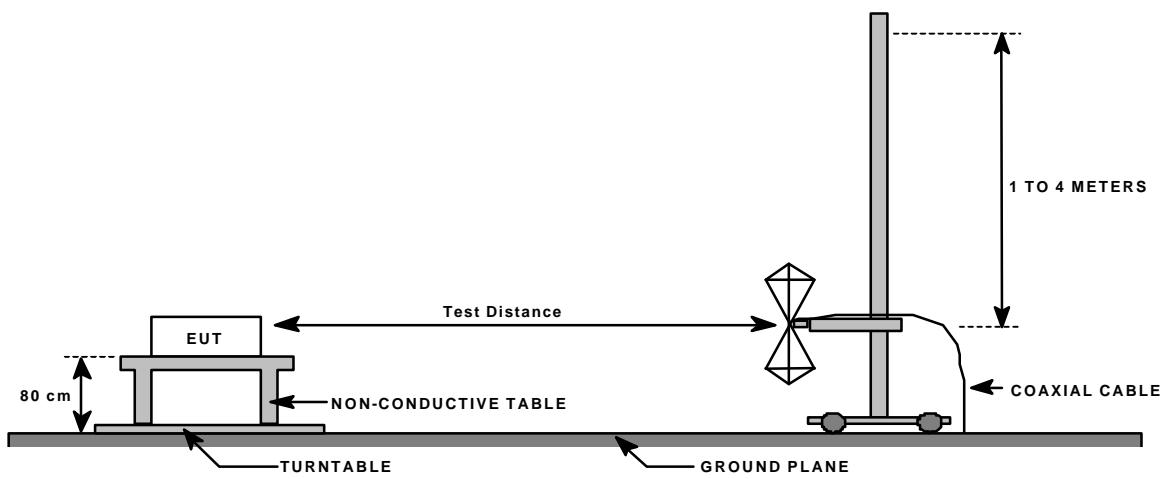
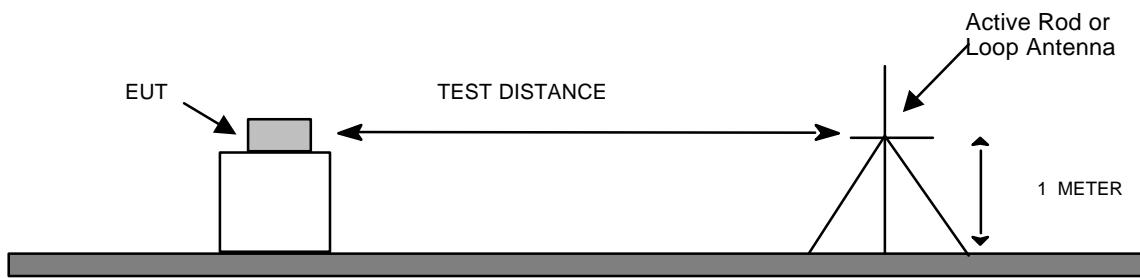
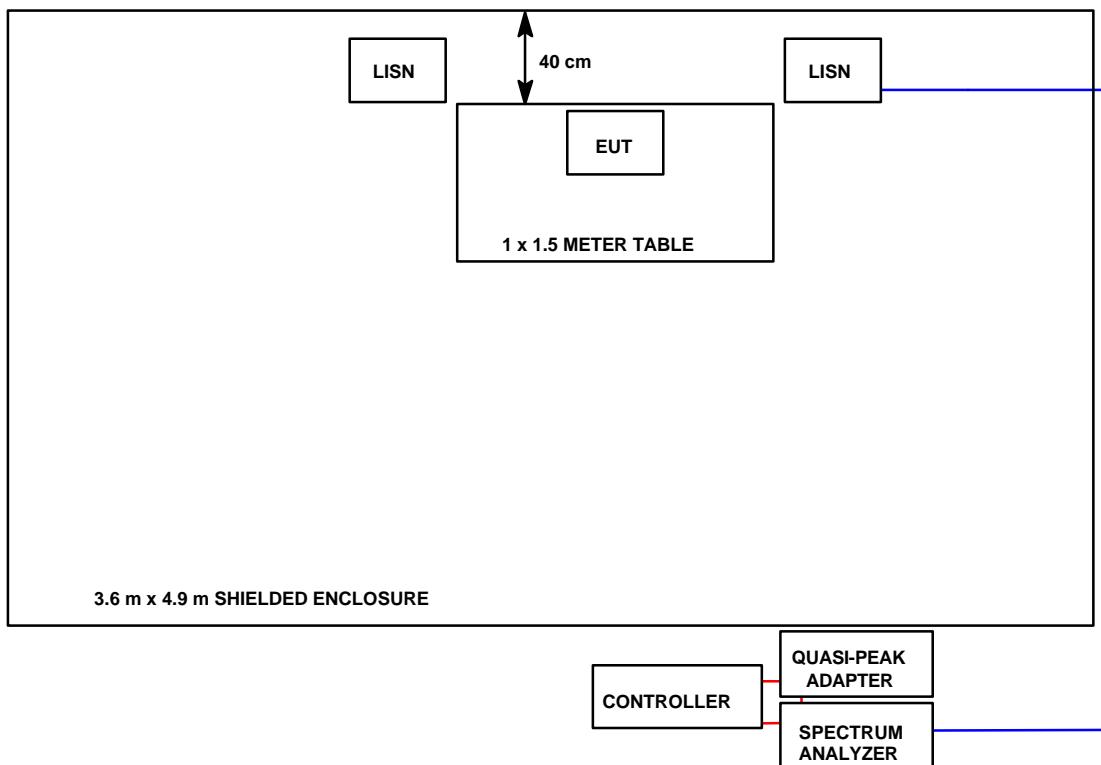


FIGURE 2 Radiated Emissions Test Setup



Intentional Emitter Test set-up.

FIGURE 3 Conducted Emissions Test Setup



Appendix A

**Fundamental and Harmonics
Emissions Data Sheets**

Fundamental and Harmonics Radiated Data Sheet
Spectrum Management
9kHz Transmitter

SERIAL #: 0022 & 0107
DATE: August 27, 2001
PROJECT #: 02079-10

MEASUREMENT DISTANCE (m): 3
DETECTOR FUNCTION: Quasi-Peak
Antenna Polarization: Active Loop

Corrected Level = Recorded Level + Antenna Factor + Cable Loss

| Freq. (kHz) | Antenna Height Meters | Rec. Level (dBuV/m) | Antenna Factor (dB) | Cable Loss (dB) | Corr. @3m (dBuV/m) | Corr. @300m (uV/m) | Limit @300m (uV/m) | Margin (uV) | Notes |
|----------------|-----------------------------|---------------------------|---------------------------|-----------------------|--------------------------|--------------------------|--------------------------|----------------|-------|
| 9.02 | 1.0 | 23.5 | 34.0 | 0.2 | 57.7 | 29.0 | 266.7 | -237.7 | 1.0 |
| 18.00 | 1.0 | 11.9 | 29.0 | 0.2 | 41.1 | 3.4 | 133.3 | -129.9 | 2.0 |
| 27.00 | 1.0 | 11.9 | 26.0 | 0.2 | 38.1 | 4.9 | 88.9 | -84.0 | 2.0 |
| 36.00 | 1.0 | 11.9 | 23.0 | 0.2 | 35.1 | 6.8 | 66.7 | -59.9 | 2.0 |
| 45.00 | 1.0 | 11.9 | 21.5 | 0.2 | 33.6 | 7.9 | 53.3 | -45.4 | 2.0 |
| 54.00 | 1.0 | 11.9 | 19.0 | 0.2 | 31.1 | 10.6 | 44.4 | -33.8 | 2.0 |
| 63.00 | 1.0 | 11.9 | 17.0 | 0.2 | 29.1 | 13.2 | 38.1 | -24.9 | 2.0 |

COMMENT: Original measurements taken in dBuV at 3m. Results extrapolated to 300m as per CFR47, Pt 15.31 (f) (2) using the square of an inverse linear distance extrapolation factor (40dB per decade). Over the two decades from 3m to 300m, this amounts to an 80dB reduction. These results were then converted to microvolts and compared to the 300m limit.

TEST ENGINEER: John Baker

Appendix B

**Spurious Radiated
Emissions Data Sheets**

Spurious Radiated Data Sheet
Spectrum Management
9kHz Transmitter

SERIAL #: 0022 & 0107
DATE: August 27, 2001
PROJECT #: 02079-10

MEASUREMENT DISTANCE (m): 3
DETECTOR FUNCTION: Quasi-Peak
Antenna Polarization: Vertical

Corrected Level = Recorded Level + Amplifier Gain + Antenna Factor + Cable Loss

| Freq. (MHz) | EUT Dir (Deg.) | Antenna Elevation (Meters) | Recorded Level (dBuV) | Amplifier Gain (dB) | Antenna Factor (dB/m) | Cable Loss (dB) | Corrected Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|----------------|----------------------|----------------------------------|-----------------------------|---------------------------|-----------------------------|-----------------------|--------------------------------|-------------------|----------------|
| 39.40 | 1.0 | 1.0 | 30.8 | 26.5 | 12.1 | 1.4 | 17.8 | 40.0 | -22.2 |
| 150.00 | 0.0 | 1.0 | 21.5 | 26.6 | 12.7 | 2.9 | 10.5 | 43.5 | -33.0 |
| 300.00 | 0.0 | 1.0 | 20.8 | 26.9 | 14.2 | 4.3 | 12.4 | 46.0 | -33.6 |
| 505.00 | 0.0 | 1.0 | 21.3 | 27.2 | 18.0 | 5.7 | 17.9 | 46.0 | -28.1 |
| 750.00 | 0.0 | 1.0 | 20.0 | 26.2 | 21.2 | 7.2 | 22.2 | 46.0 | -23.8 |
| 990.00 | 0.0 | 1.0 | 20.5 | 26.7 | 23.9 | 9.3 | 27.0 | 54.0 | -27.0 |

TEST ENGINEER: John Baker

Spurious Radiated Data Sheet
Spectrum Management
9kHz Transmitter

SERIAL #: 0022 & 0107
DATE: August 27, 2001
PROJECT #: 02079-10

MEASUREMENT DISTANCE (m): 3
DETECTOR FUNCTION: Quasi-Peak
Antenna Polarization: Horizontal

Corrected Level = Recorded Level + Amplifier Gain + Antenna Factor + Cable Loss

| Freq. (MHz) | EUT Dir (Deg.) | Antenna Elevation (Meters) | Recorded Level (dBuV) | Amplifier Gain (dB) | Antenna Factor (dB/m) | Cable Loss (dB) | Corrected Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|----------------|----------------------|----------------------------------|-----------------------------|---------------------------|-----------------------------|-----------------------|--------------------------------|-------------------|----------------|
| 35.00 | 0.0 | 4.0 | 27.3 | 26.5 | 12.0 | 1.3 | 14.0 | 40.0 | -26.0 |
| 150.00 | 0.0 | 4.0 | 21.0 | 26.6 | 12.7 | 2.9 | 10.0 | 43.5 | -33.5 |
| 300.00 | 0.0 | 4.0 | 21.3 | 26.9 | 14.2 | 4.3 | 12.9 | 46.0 | -33.1 |
| 505.00 | 0.0 | 4.0 | 20.8 | 27.2 | 18.0 | 5.7 | 17.4 | 46.0 | -28.6 |
| 750.00 | 0.0 | 4.0 | 20.3 | 26.2 | 21.2 | 7.2 | 22.5 | 46.0 | -23.5 |
| 990.00 | 0.0 | 4.0 | 20.8 | 26.7 | 23.9 | 9.3 | 27.3 | 54.0 | -26.7 |

TEST ENGINEER: John Baker

Appendix C

**Conducted Emissions
Data Sheets**

Conducted Emissions Data Sheet
Spectrum Management
9kHz Transmitter

SERIAL #: 0022 & 0107

DATE: August 27, 2001

PROJECT #: 02079-10

DETECTOR FUNCTION: Quasi-Peak

LINE MEASURED: Neutral

| FREQ | READING | CORR | CORR | Limit | Margin | Detector |
|--------|---------|--------|---------|-------|--------|----------|
| INPUT | INPUT | FACTOR | READING | | | |
| MHz | dBuV | dB | dBuV | dBuV | dB | Function |
| 0.627 | 18.6 | 0.1 | 18.7 | 48 | -29.3 | Peak |
| 0.636 | 18.6 | 0.1 | 18.7 | 48 | -29.3 | Peak |
| 0.645 | 18.5 | 0.1 | 18.6 | 48 | -29.4 | Peak |
| 7.164 | 11.7 | 1.2 | 12.9 | 48 | -35.1 | Peak |
| 10.745 | 18.4 | 1.7 | 20.1 | 48 | -27.9 | Peak |
| 17.910 | 13.7 | 2.7 | 16.4 | 48 | -31.6 | Peak |

COMMENT: 110VAC/ 60Hz

TEST ENGINEER: John Baker

Conducted Emissions Data Sheet
Spectrum Management
9kHz Transmitter

SERIAL #: 0022 & 0107
DATE: August 27, 2001
PROJECT #: 02079-10

DETECTOR FUNCTION: Quasi-Peak
LINE MEASURED: Phase

| FREQ | READING | CORR | CORR | Limit | Margin | Detector |
|--------|---------|--------|---------|-------|--------|----------|
| INPUT | INPUT | FACTOR | READING | | | |
| MHz | dBuV | dB | dBuV | dBuV | dB | Function |
| 0.62 | 10 | 0.2 | 10.2 | 48 | -37.8 | Peak |
| 0.629 | 9.9 | 0.2 | 10.1 | 48 | -37.9 | Peak |
| 0.639 | 9.9 | 0.2 | 10.1 | 48 | -37.9 | Peak |
| 7.163 | 11.2 | 1.4 | 12.6 | 48 | -35.4 | Peak |
| 10.746 | 18.3 | 2.0 | 20.3 | 48 | -27.7 | Peak |
| 17.910 | 13.9 | 3.1 | 17.0 | 48 | -31.0 | Peak |

COMMENT: 110VAC/ 60Hz

TEST ENGINEER: John Baker