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ELECTROMAGNETIC FIELD MEASUREMENTS
AT PIKES PEAK FM & TV TRANSMITTER SITE
WALLA WALLA, WASHINGTON

CLEAR CHANNEL COMMUNICATIONS

August 2003

INTRODUCTION

On 26 August 2003, radiofrequency power density measurements were made around the FM transmitting facility at Pikes Peak, south of Walla Walla, Washington. (The transmitter site is located in the State of Oregon, but Walla Walla is the nearest city of any size.) The measurements were made between the hours of 9:00 AM and 11:00 AM. FM and TV transmitters were believed to be operating at 100% of licensed power as the measurements were made. The high power FM and TV facilities located at Pikes Peak are:

| Call | Channel | Frequency | Licensed Power ERP | Antenna Type Element Spacing | Height of Radiation Center Above Ground Level |
|---------|---------|-----------|--------------------|---|--|
| KWWS-FM | 209C2 | 89.7 MHz | 3.2 kW | 2 Bay ERI 1.0 wavelength | 30 m |
| KNLT-FM | 239C | 95.7 MHz | 100 kW | 8 Bay McMartin Directional Antenna 1.0 wavelength | 45 m |
| KXRX-FM | 246C | 97.1 MHz | 100 kW | 10 Bay ERI 0.5 wavelength | 23 m |
| KHSS-FM | 264C3 | 100.7 MHz | 1.3 kW | 1 Element PSI | 34 m |
| K33EJ | Ch. 33 | 584 MHz | 1.7 kW | 4 Element Panel | 18 m |

Note: There is another FM and TV transmitting facility 600 meters north of this site.

SITE ACCESS AND LOCATION

The Pikes Peak transmitter site is located on a remote mountain top accessible only by a gravel road. There is a locked gate located at the turn-off to the access road to the transmitter site. There is a barbed wire fence that completely encompasses the transmitter site. However, the transmitter site is not posted with the appropriate RFR warning signs. The boundaries of the FM transmitter site are clearly demarcated by the fence location.

MEASUREMENT PROCEDURES

Measurement procedures outlined in **OET BULLETIN 65, (EDITION 97-01)**, [OET 65] **“Evaluating Compliance With FCC-Specified Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields”**, **ANSI/IEEE Std C95.3-1991, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields--RF and Microwave**, and **NCRP Report No. 119, “A Practical Guide to the Determination of Human Exposure to Radiofrequency Fields”** were used for the measurements taken at the Pikes Peak site. Spatially averaged measurements were made at the points where the highest fields were found.

According to the ANSI C95.3 guidelines (reaffirmed in OET 65) measurements to determine exposure compliance are to be made at distances 20 cm or greater from any object. This is to assure that the measurements are not contaminated by re-radiation from conductive objects.

TEST EQUIPMENT USED

A NARDA Model 8718B Electromagnetic Radiation Survey Meter with a NARDA Model B8742 Isotropic Shaped Electric Field Probe was used to make the measurements. The NARDA B8742 probe provides an output proportional to **CFR 47 §1.1310 Radiofrequency Radiation Exposure Limits** (Occupational/Controlled Environments) maximum permissible exposure (MPE) over a frequency range from 300 kHz to 2.7 GHz. The isotropic response of the NARDA B8742 probe is +/-0.75dB.

The NARDA Model 8718B Electromagnetic Radiation Survey Meter allows for accurate and repeatable spatially averaged measurements through the use of its time averaging feature. A single key stroke implements the meter's time averaging function as the probe is swept through an area that approximates that of the human body. Spatial Point fields are also stored by the meter during the spatially averaged measurement.

The NARDA diode probes, such as the Model 8742, are designed to provide signal detection on a square law basis and yields accurate readings of fields from multiple sources. Other available measurement devices, such as those manufactured by Holaday and Wandel & Golterman, use linear detection and square the signals after adding. If there are two signals of roughly equal intensity, $E_1 + E_2$ the desired summation is $(E_1)^2 + (E_2)^2$. The result obtained by squaring the signals after addition is $(E_1)^2 + (E_1)(E_2) + (E_2)^2$. The $(E_1)(E_2)$ term results in a measurement error. For this reason the most accurate measurements of RF fields using diode detection are provided by use of probes such as the NARDA 8742D probe that utilize square law detection. Diode probe errors are also discussed in “*Multiple-Source, Multiple Frequency Error of an Electric Field Meter*” (Randa and Kanda).

| Item | Make/Model | Serial Number | Calibration Date |
|--|----------------|---------------|------------------|
| RF Survey Meter | Narda 8718B | 0001 | September 2002 |
| Isotropic Shaped Electrical Field Probe (IEEE/ANSI Controlled Environments): 300 kHz-2.7 GHz | Narda B8742 | 001001 | July 2003 |

MEASURED FIELDS

The measured fields around the FM transmitter site are shown in the following tables and map. The measured field at each location is shown as the spatially averaged fields and is shown as a percentage of the Occupational/Controlled Environment MPE. All other areas outside the fenced area are below the FCC General Population/Uncontrolled Environment MPE.

| Location | | Percent of FCC Occupational Environment MPE ¹ |
|----------|---|--|
| 1 | By door of transmitter building | 15.6% |
| 2 | North end of parking area | 14.9% |
| 3 | By north guy line from KNLT's tower | 2.7% |
| 4 | By southeast guy line from KNLT's tower | 65.3% |
| 5 | By southwest guy line from KNLT's tower | 88.5% |
| 6 | 10' southwest of KNLT's tower on dirt mound | 52.1% |
| 7 | South side of diesel fuel tank | 30.5% |
| 8 | By satellite dish on southwest side of building | 9.4% |
| 9 | 40' West of KXRX tower | 27.5% |
| 10 | South side of diesel fuel tank | 30.5% |
| 11 | West side of building on mound | 20.3% |
| 12 | South corner of roof at roof level | 46.7% |

These measurements show that there are no locations outside of the fenced area that exceed the FCC General Population/Uncontrolled MPE, and there are no areas within the fenced site that exceed the FCC Occupational/Controlled MPE. The highest field that was encountered on the site was 88.5% of the Occupational/Controlled MPE; this location is within the fenced area.

¹According to **CFR 47 §1.1310 Radiofrequency Radiation Exposure Limits**, the General Population/Uncontrolled Environment MPE is 20% of the Occupational/Controlled Environment MPE.

RECOMMENDATIONS

- C This site is to be considered a controlled environment. As such it is required to have an RF safety plan and posted warning signs.
- C Non-expert occupational users of the site such as contractors, meter readers and other workers, should be given a copy of the site safety plan and be given an orientation by the site engineers before they are allowed access to the site. A draft copy of this plan is included in the appendix.
- C Warning signs such as those shown on the right shall be posted on the gate, along the fence and on the tower. These signs are available from Richard Tell Associates, Inc.
(<http://www.radhaz.com/rfsigns.asp>)
- C With these recommendations this site will be complying with the FCC rules concerning RF exposure.



STATEMENT OF ENGINEER

This Engineering Report regarding radiofrequency field measurements around the Pikes Peak FM and TV transmitter site located south of Walla Walla, Washington has been prepared by myself or under my direct supervision. All representations contained herein are true to the best of my knowledge. I am an experienced radio engineer whose qualifications are a matter of record with the Federal Communications Commission. I am a partner in the firm of Hatfield and Dawson Consulting Engineers and am Registered as a Professional Engineer in the States of Washington and Alaska.

Stephen S. Lockwood, P.E.

27 August 2003



Pikes Peak, Walla Walla, Washington RF Safety Plan

Contact List for High Power Facilities

| Call | Channel | Frequency | Engineer | Phone |
|---------|---------|-----------|-----------------|--------------|
| KWWS-FM | 209C2 | 89.7 MHz | Ralph Hogan | 509-335-6500 |
| KNLT-FM | 239C | 95.7 MHz | | |
| KXRX-FM | 246C | 97.1 MHz | Charles Ince | 509-547-9791 |
| KHSS-FM | 264C3 | 100.7 MHz | Tod Brandenburg | 509-525-7878 |
| K33EJ | Ch. 33 | 584 MHz | | |

Areas within the fence of this site are considered a controlled environment.

No work shall be done on the towers while the antennas are operating unless a personal RF monitor is used. The roof top areas have been surveyed and are below the FCC MPE for Occupational/Controlled environments.

Station engineers shall keep a sign-in log for those who have visited the site. This shall include name, employer, activity, time, date and duration of time spent at site.

General RF Safety considerations apply at this site. These are:

- C All personnel at this site shall have RF awareness training
- C Do not work on antennas that are operating
- C Obey all posted signs
- C Assume all antennas are operating unless you know otherwise
- C Do not loiter around tower bases
- C Do not work on towers that have operating antennas

NOTE: SITE IS FENCED FOR LIVESTOCK WITH A LOCKED GATE- FENCE PERIMETER NOT SHOWN.

DOWNSLOPING TERRAIN

KWSS-FM
K33EJ-TV

DIRT MOUND

11

SATELLITE DISH

8

12

PARKING

1

2

9

KXRX-FM

10

FUEL TANK

7

OLD KXRX TOWER
KHSS-FM

5

KNLT-FM

6

DIRT MOUND

DOWNSLOPING TERRAIN

4

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8/27/2003 11:08 AM

Bob Allen

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8/2003