

# ***KLEIN BROADCAST ENGINEERING, L.L.C.***

*dedicated to improving the science and technology of radio & television communications*

NOVEMBER 2003

EXHIBIT E-10RHS  
FCC FORM 302-FM APPLICATION  
FOR MODIFICATION of FM BROADCAST STATION LICENSE  
AGM-ROCKY MOUNTAIN BROADCASTING I, L.L.C.  
K K C H  
FM CHANNEL 224 C / 92.7 mHz.  
GLENWOOD SPRINGS , COLORADO

## RF RADIATION HAZARD COMPLIANCE STATEMENT

The facilities proposed herein by the applicant, permittee or licensee, in this Engineering Exhibit comply with FCC O.S.T. Bulletin #65 and #65A as revised (1997) and the ANSI C-95.1-1982 RF and ANSI C95.1992 and the NCRP exposure guidelines. The interpolation of the figures from the above referenced document, page 18, supplement "A", shows a BEST case requirement of 32.9 meters height above ground level requirement for the radiation center of the installed six (6) bay 0.926 wave length spaced FM broadcast antenna. A combined vertical and horizontal effective radiated power of 112.0 kilowatts was used for this study and determination (56.0 kW Horiz. & 56.0kW Vert.) The radiation center of the FM broadcast antenna system is located at 33 meters above ground level (AGL), within the requirement for the antenna as determined from the above referenced documents. The antenna specified for use is an Electronics Research, Inc., model SHPX6-AC-SP, EPA Type 3, six (6) section, 0.926 wave length spaced, circularly polarized antenna. The antenna manufacturer, Electronics Research, Inc., states its antenna meets the BEST case requirements for downward radiation pattern according to the FCC O.S.T. Bulletin #65 Guidelines. The antenna uses -0.7 degrees of beam tilt, with 5% second null fill and 10% first null fill.

Occupational compliance is certified by the reduction of operating power or the complete cessation of operation during such time maintenance personnel are on the antenna support structure. A transmitter "LOCK OUT" circuit has been installed to prevent accidental turn on of the transmission equipment during the time maintenance personnel are on the antenna support structure. The applicant, permittee or licensee will cooperate with other site users in order to comply with The FCC Guidelines on Human Exposure to Non-Ionizing RF Radiation.

In addition to the preceding the applicant, permittee or licensee, has by computer program, performed additional calculations to predict RF power density at the base of the antenna support structure. This program predicts a maximum power density of 71.0323 microwatts/cm<sup>2</sup> at a distance of 6 meters from the base of the antenna support structure at a height of 2.0 meters above ground level. This is less than 36% of the allowable RF power density for uncontrolled areas under the FCC and ANSI/EPA Guidelines, being limited to: 1.00mW/cm<sup>2</sup> for controlled areas and 200.0 microwatts/cm<sup>2</sup> for uncontrolled areas. All other power density was calculated to be below this maximum predicted level for a distance of 0 to 1000 meters distance from the base of the antenna support structure at 2.0 meters above ground level.

There are two other sources of significant RFR at the KKCH site, which is that of the co-located TV Station KREG-TV and KREG-DT.

The E.R.P. of KREG-TV is 67.6kW in both the horizontal plane only with an antenna radiation center at 62 meters AGL. KREG-TV operates with an EPA Type 1 antenna using 8 sections. The calculated contribution to the RFR levels on the KKCH site from KREG-TV is 36.200 microwatts/cm<sup>2</sup> at a distance of 17 meters from the base of the antenna support structure, at 2 meters above ground level.

The E.R.P. of KREG-DT is 5.6kW in the horizontal plane only with an antenna radiation center of 35 meters above ground level. KREG-DT operates with an EPA Type 1 antenna using two full wavelength spaced sections. The calculated contribution to the RFR levels on the KKCH site from KREG-DT is 43.894 microwatts/cm<sup>2</sup> at a distance of 12 meters from the base of the antenna support structure, at 2 meters above ground level.

To determine the worst case RFR power density levels on the KKCH site from all three significant sources of RF radiation one may simply arithmetically sum the calculated maximum RFR level for each source. This equals 151.1263 microwatts/cm<sup>2</sup> or less than 75.6% of the allowable maximum RFR power density level for Uncontrolled areas subject to General Public exposure.

The computer program employed for the RFR analysis in this engineering exhibit uses either the Near Field or Far Field method for the calculation of power density and was written by the Commission's O.E.T. staff. In this particular case the Far Field Method was used. The formula used by the computer program was derived from the FCC O.S.T. Bulletin #65, as revised to date.

The formula may be stated in the following manner:

$$E(V/m) = 1.6 * 221.72 * \text{SQRT}(\text{ERP}) * (\text{element pattern factor}) * (\text{array factor}) / \text{DIST}$$

$$H(A/m) = 1.6 * 0.588 * \text{SQRT}(\text{ERP}) * (\text{element pattern factor}) * (\text{array factor}) / \text{DIST}$$

Where:

ERP = effective radiated power in kilowatts, relative to a half wave dipole.

DIST = distance in meters from the antenna radiation center to the observation point in meters.

The 1.6 factor found in the ANSI/EPA formula and used above at the beginning of each equation takes into account possible contributions from ground reflections. The element pattern factor in a linearly interpolated relative field value at the appropriate depression angle below the horizon as taken directly from the EPA data. The array factor is computed at the appropriate depression angle using the number of antenna elements, when normalized to 1.0 in the main lobe. This array factor only applies to antenna arrays of point sources where each source has equal power distribution and phase, and are uniformly spaced. The element patterns themselves can be associated with particular antenna designs. As of May 1986 there were six (6) element types identified for FM antennas as listed in the ANSI/EPA data and FCC Bulletin #65. The "crossed ring" EPA Type 3 element is used on the Electronics Research, Inc., model SHPX12-AC-SP, EPA Type 3 is listed in the EPA data and was used for the calculations contained herein. There were two types listed for television, one for VHF and one for UHF.

The General Public will not have access to the site, tower base or transmission equipment building because the site is in a sparsely populated , remote, mountainous and rural area. The only access to the site is by four wheel drive dirt road. There are two locked gates across the only access road to the site. Only authorized personnel have access to these two locked gates. This will restrict General Public access to the actual site, tower base and transmission equipment building.

The applicant, permittee or licensee, has installed and posted RF Radiation Hazard Warning Signs in and around the site at approximately eye level for additional warning and safety.

A vertical pattern plot of the Electronics Research, Inc., model SHPX6-AC-SP (EPA Type 3) antenna employed at KKCH is included herein and is marked Figure #1. This plot clearly shows this antenna has greatly reduced downward radiation and meets the BEST case requirements of FCC Bulletin #65, as amended to date. A graph of the RFR power density vs. Distance for this antenna is also included herein and is marked Figure #2.

The preceding assures compliance with the FCC, ANSI and NCRP requirements. Based on the preceding documents, tables, guidelines and calculations, the proposed operation of the main transmission facility for KKCH FM Broadcast Station is in compliance with the FCC O.S.T. Bulletin #65 and the ANSI C-95.1-1992 and the NCRP RF Exposure Guidelines as amended to date. The applicant, permittee or licensee certifies compliance with the ANSI, NCRP and FCC Human Exposure Guidelines to Non-Ionizing RF Radiation.

EXHIBIT E-10 Figure #1. Elevation Pattern Plot KKCH

3-20-2003

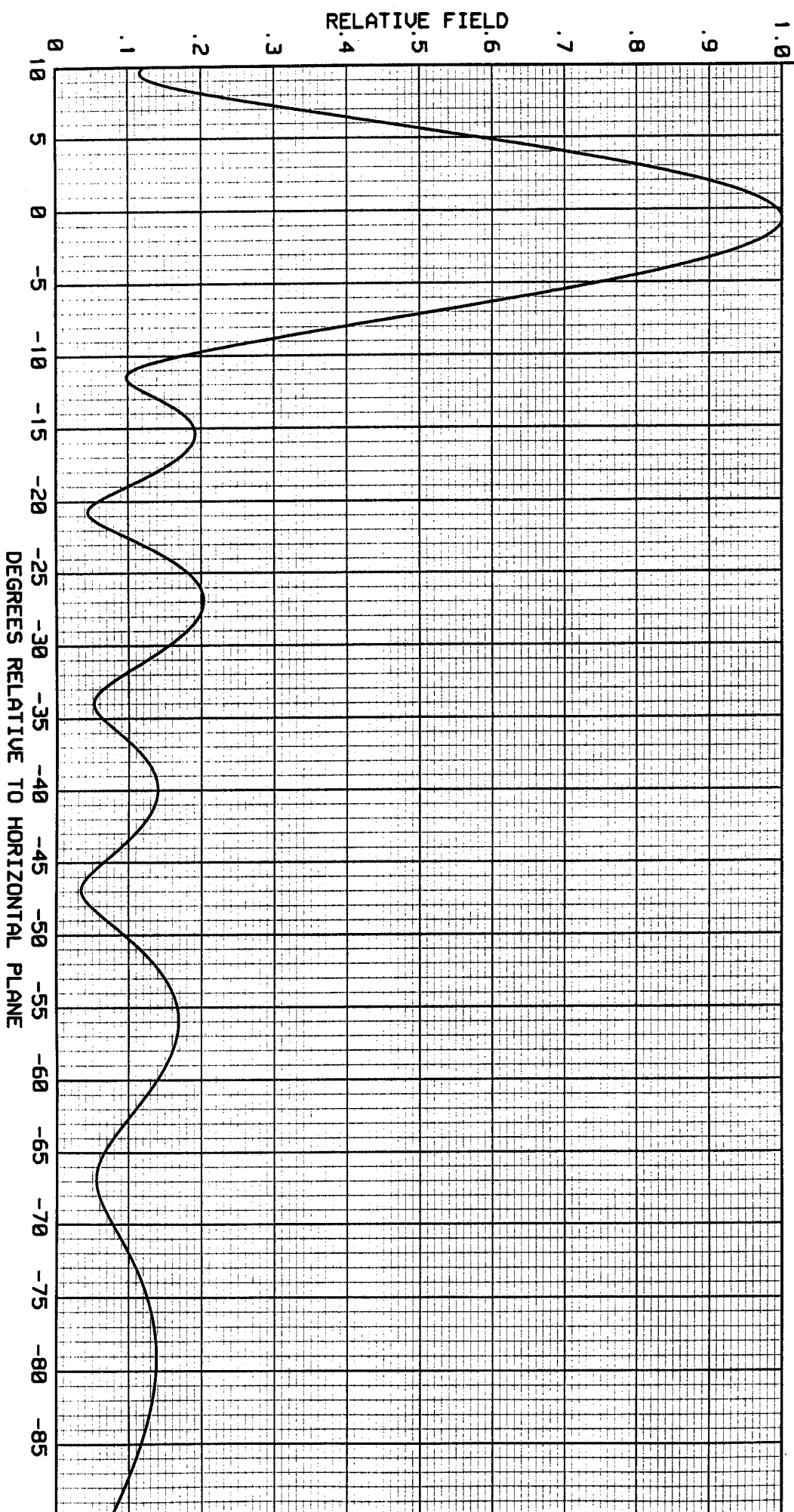
ELECTRONICS RESEARCH, INC.  
7777 GARDNER ROAD  
CHANDLER, IN. 47610

FIGURE 1

6 ERI TYPE SHP, SHPX, LP, OR LPX ELEMENTS  
-.7 DEGREE(S) ELECTRICAL BEAM TILT  
10 PERCENT FIRST NULL FILL  
5 PERCENT SECOND NULL FILL

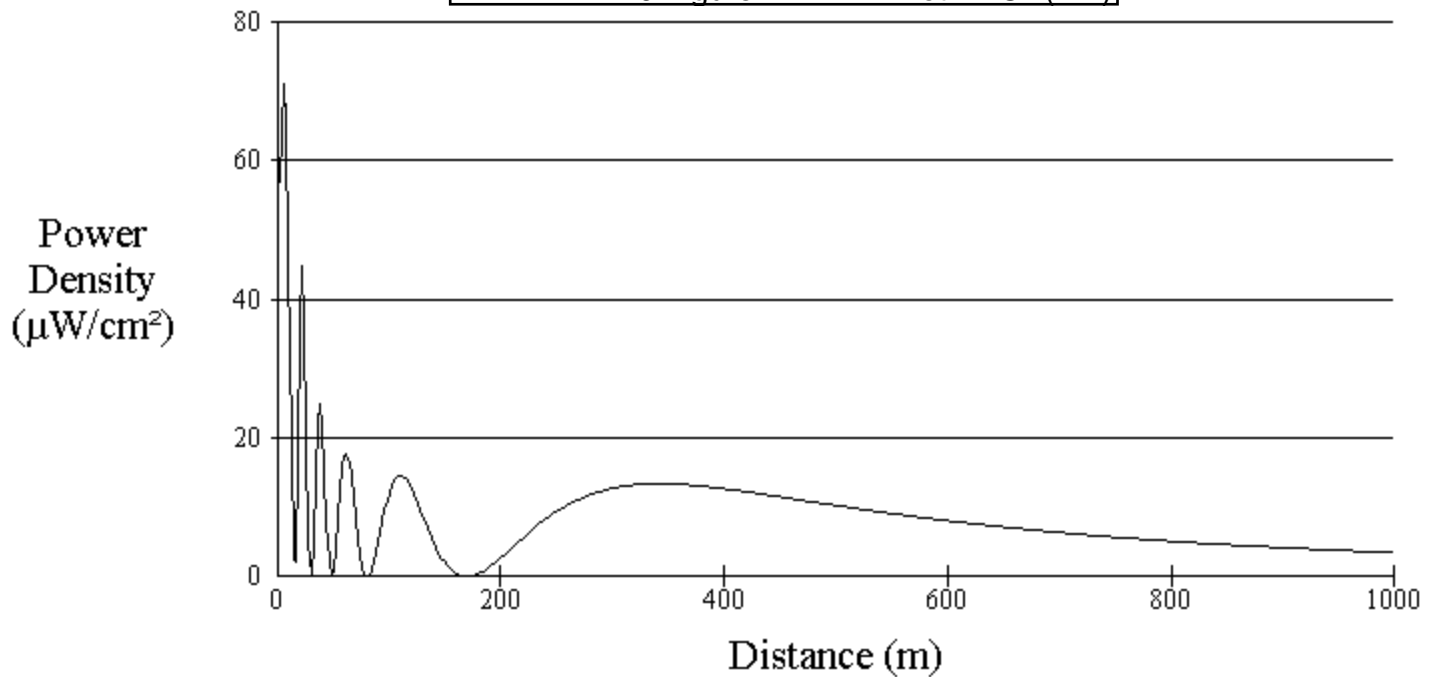
ELEMENT SPACING:  
0.926 WAVELENGTH

POWER GAIN IS 3.090 IN THE HORIZONTAL PLANE(3.135 IN THE MAX.)



## Power Density vs Distance

EXHIBIT E-10 Figure #2. RFR Plot KKCH(FM)



### Office of Engineering and Technology

Distance (m):	<input type="text" value="1000"/>	Antenna Type:	<input type="text" value="ERI or JAMPRO JBCP 'Rototiller' (EPA)"/>
Horizontal ERP (W):	<input type="text" value="56000"/>	Number of Elements:	<input type="text" value="6"/>
Vertical ERP (W):	<input type="text" value="56000"/>	Element Spacing:	<input type="text" value=".926"/>
Antenna Height (m):	<input type="text" value="33"/>		

Maximum RFR power density = 71.0323  $\mu\text{W}/\text{cm}^2$  (microwatts per square centimeter) at a distance of 6 meters from the base of the existing antenna support structure, 2 meters above ground level.

Antenna Make & Model: Electronics Research, Inc. , SHPX6-AC-SP

This antenna has 0.926 wavelength element spacing to greatly reduce downward radiation.