

**MULLANEY ENGINEERING, INC.**

9049 SHADY GROVE COURT  
GAITHERSBURG, MD 20877

**ENGINEERING EXHIBIT EE-1:**

**RADIO STATION KSKX (FM)  
OPTIMA COMMUNICATIONS, INC.  
SECURITY, COLORADO**

**Ch. 288C2 1.65 KW 682 M HAAT**

**OCTOBER 27, 2003**

**ENGINEERING STATEMENT IN SUPPORT OF  
AN AMENDMENT TO  
A PENDING APPLICATION FOR AN  
UPGRADE OF AN FM STATION**

**File No. BPH-20010806ABB - Facility ID: 50402**

**ATTACHED TO EXHIBIT 24 OF FCC FORM 301**

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**TABLE OF CONTENTS:**

1. F.C.C. Form 301.
2. Declaration of Engineer
3. Narrative Statement
4. Figure 1, Topographic Map Showing Proposed Site. ##
5. Figure 2, Proposed Coverage Map.
6. Figure 3, Vertical Tower Sketch. ##
7. Figure 4, Channel Study - Proposed Site.
8. Figure 4-A, Channel Study - RM Reference.
9. Figure 5, Contour Protection Map.
10. Figure 6, Antenna Vertical Elevation Plot.
11. Figure 6-A, RF Exposure Analysis Plot.

## - Not Required.

## Declaration

I, John J. Mullaney, declare and state that I am a graduate electrical engineer with a B.E.E. and my qualifications are known to the Federal Communications Commission, and that I am an principal engineer in the firm of Mullaney Engineering, Inc., and that I have provided engineering services in the area of telecommunications since 1977. My qualifications as an expert in radio engineering are a matter of record with the Federal Communications Commission.

The firm of Mullaney Engineering, Inc., has been requested by Optima Communications, Inc., to prepare the instant engineering exhibit in support of an amendment to a pending application for Construction Permit for an upgrade to C2 facilities for FM radio station KSKX licensed at Security, Colorado (FCC Facility ID Number: 50402).

All facts contained herein are true of my own knowledge except where stated to be on information or belief, and as to those facts, I believe them to be true. I declare under penalty of perjury that the foregoing is true and correct.

/s/ John J. Mullaney

John J. Mullaney, Consulting Engineer

Executed on the 27th day of October 2003.

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OPTIMA COMMUNICATIONS, INC.  
SECURITY, COLORADO**

**Ch. 288C2 1.65 KW 682 M HAAT**

**NARRATIVE STATEMENT:**

**I. General:**

This engineering statement has been prepared on behalf of Optima Communications, Inc., licensee of KSKX(FM) on Ch. 288C3 at Security, Colorado. The purpose of this statement is to amend a pending upgrade application to specify C2 in lieu of C1 facilities. KSKX now requests to operate on Channel 288C2 with an ERP of 1.65 KW and an HAAT of 682 Meters. This application proposes facilities which are in compliance with the contour protection requirements of Section 73.215. This application is dependent upon the substitution of Ch. 291C3 for 288C3 at Genoa, CO.

The application is not a major environmental action, as defined by Section 1.1307 of the Commission's Rules. The proposed facility is in full compliance with both the "controlled" & "un-controlled" FCC Radiation Guidelines. Since the proposed facility contributes less than 1% of the "controlled" standard it is categorically excluded from further consideration.

Answers to questions contained in F.C.C. Form 301, are incorporated in the following paragraphs and figures.

## **II. Engineering Discussion:**

### **A. Proposed Location:**

KSKX(FM) proposes to remain at its existing C3 site which is located at Cheyenne Mountain electronic site, on the west side of Colorado Springs. A topographic map showing the proposed site is not required. The NAD-27 geographic coordinates are:

Latitude: 38° 44' 40"

Longitude: 104° 51' 41"

The city of license, Security, Colorado, is located approximately 10.4 kilometers east of the proposed site. The Regional Office of the FAA was not notified of this proposal since no change in tip height is proposed. The current Antenna Structure Registration number is **1023337**.

### **B. Antenna System and Tower:**

A dual polarized 2-bay half-wave spaced FM antenna will be side mounted on the tower (ERI LPX-2E). The antenna has a non-directional power gain of 0.7 H/V.

### **C. Effective Radiated Power:**

Giving consideration for the maximum antenna gain, transmitter power and line loss, the maximum Effective Radiated Power is 1.65 KW for the Horizontal and 1.65 KW for the Vertical Component.

A Class-C2 FM station is restricted to a maximum of 50 KW (ERP) up to a maximum Height Above Average Terrain (HAAT) of 150 Meters. This proposal will operate with an HAAT that exceeds the maximum and consequently must

reduce its ERP in order to obtain equivalent coverage within the 1.0 mV/m contour.

Current F.C.C. policy permits stations that are beyond 320 kilometers from the Mexican or Canadian Borders to use the F(50,50) curves to determine what reduced power at their HAAT will provide the equivalent maximum 1.0 mV/M coverage allowed.

Using the curve, it was determined that Class C2 operations at an HAAT of 682 Meters requires the ERP to be greater than 0.42 and no greater than 1.65 KW.

**D. Channel Allocation:**

Figure 4 is a channel allocation study from the proposed site. The proposed site is short spaced under the rules to two stations. The first short spacing of 23.3 kilometers is to a Vacant allotment on Ch. 288C3 at Genoa, CO. However, there is a pending rule making to substitute Ch. 291C3 and this resolves the short spacing. The second short spacing of 4.9 kilometers is to KXKL on 286C at Denver, CO. This short spacing will be protected through contour protection (Section 73.215). In all other respects this application is in compliance with Section 73.207(a).

**1. Contour Protection - Section 73.215:**

Figure 5 is a map of the protected 60 dBu and the second adjacent interfering 100 dBu contour proposed by this application. In addition, the map shows the same protected & interfering contours for KXKL except that they are based upon maximum permissible ERP and HAAT for their respective Class.

As can be seen, no prohibited overlap occurs. All contours are based upon terrain radials spaced every 5 degrees.

**E. Terrain Profile Data & Coverage:**

Terrain profile data was extracted from the NGDC 30 Second Digitized Terrain Data Base provided out of Boulder, Colorado. At least twenty-four bearings (every 15 degrees) were used to obtain the proposed coverage data. The standard eight bearings (every 45 degrees) were used to obtain the proposed HAAT.

The predicted service contours, as shown in the attached report, were computed using a mathematical model adapted for computer use of data shown in Figure 1 of Section 73.333. This is the Commission's computer program TV FM FS REPORT RS-76-01, dated January 1976.

**F. Terrain Profile to City of License:**

The N-90-E radial is the direct path to the City of License. From the proposed site the 3.16 mV/M or 70 dBu City Grade Contour will completely encompass the City of License without major terrain obstruction. This site is already licensed for C3 operations at 0.41 kW.

**G. FM Blanketing Contour:**

KSKX(FM) recognizes its obligation to resolve related interference complaints for a one year period within its 115 dBu "FM Blanketing Contour" as required by Section 73.318 of the FCC Rules.

The radius around the base of the tower in which Blanketing interference is possible is fairly small (0.5 km). Given the height of the proposed antenna and

the fact that this is the existing site, no problems are anticipated.

**H. Other Services in Area:**

There are no known AM Broadcast Stations within 3.2 kilometers of the proposed site.

This is an established electronic site with **numerous** other transmission facilities in the immediate area.

There are other known FM or TV transmitters within 10 kilometers (6.2 miles) of the proposed site, however, based upon the type of transmitter proposed, and the frequency & power involved no intermodulation interference problems with existing transmitting facilities is expected. In the event some problems would occur, KSKX(FM) will investigate and correct such cases in accordance with the Commission's Rules.

**I. Environmental Assessment Statement:**

KSKX(FM) believes its proposal will not significantly affect the environment since it does not meet any of the criteria specified in Section 1.1307 of the rules. Since an existing tower will be used with no change in overall height the only remaining environmental issue is R.F. Exposure. Specifically the proposed facility:

- 1) Will NOT involve the exposure of workers or the general public to levels of Radio Frequency radiation in excess of the guidelines recommended by the FCC - OET Bulletin 65 (August 25, 1997).



The following is a more detailed discussion of this protection standard:

**A. National Environmental Policy Act of 1969:**

In 1969, Congress enacted the National Environmental Policy Act (NEPA), which requires the FCC to evaluate the potential environmental significance of the facilities it regulates and authorizes. Human exposure to Radio Frequency (RF) radiation had been identified as an issue that the FCC must consider.

Beginning with the filing of applications after January 1, 1986, broadcast stations were required to “certify compliance” with FCC prescribed guidelines on human exposure to RF radiation. The FCC standard was based upon the American National Standards Institute’s (ANSI) RF radiation protection guides (ANSI C95.1-1982). These exposure limits are expressed in terms of milli-watts per square centimeter.

In October 1997, the FCC implemented a two tier evaluation criteria utilizing recommendations of the National Council on Radiation Protection and Measurement (NCRP). The “controlled” tier involves areas which have restricted access while the “un-controlled” tier involves areas which have unrestricted access. The Maximum Permissible Exposure (MPE) limits for “controlled” areas are the same as adopted in 1985, while the “un-controlled” limits for FM and TV frequencies are one-fifth or 20% of the limits for “controlled” areas.

These exposure limits are time-averaged over any six minute period and vary depending upon the frequency involved. The following are the Maximum Permissible Exposure (MPE) limits for “controlled” areas:

Frequency Range (MHz)	Power Density (mW/sq.cm)
*****	*****
0.3 to 3	100 AM
3 to 30	900/(Freq <sup>2</sup> )
30 to 300	1.0 VHF TV & FM
300 to 1,500	Freq/300 UHF TV
1500 to 100,000	5.0

KSKX(FM) recognizes that compliance with the above criteria at sites involving multiple AM, FM and/or TV facilities is based upon the contributions of all such facilities. At the site discussed in this application, **there are numerous significant transmission facilities**, however, as will be shown this proposed C2 facility is **categorically excluded** from having to conduct a complete analysis.

### FM Broadcast Stations

For FM Broadcast Stations the following formula is used:

$$D = \frac{\text{SQRT}(F^2 * [HERP + VERP])}{1.667 * \text{SQRT}(PD) * 3.2808}$$

Where:

- D = the closest distance in meters that a human should come to an operating antenna (To obtain feet multiply by 3.2808)
- F = typical relative field factor in downward direction (F=1 is worst case main lobe)
- HERP = Horizontal ERP in watts (above a dipole)
- VERP = Vertical ERP in watts (above a dipole)
- PD = highest Power Density in milli-watts/cm<sup>2</sup>
- SQRT = Square Root
- Freq = Frequency in mega-cycles/sec. (MHz)

The vertical radiation pattern of the FM antenna specified in this application is very narrow and, therefore, the power density as seen by an observer on the ground near the base of the tower will be less than 10 percent of the total ERP.

The application of the above equation (assuming maximum ERP), in our case, for a frequency of 105.5 MHz and an “un-controlled” Power Density of 0.2 milliwatts results in a minimum distance of 23.5 meters (77.1 feet) from the antenna. Inasmuch as the lowest element on the proposed antenna will be approximately 55 meters (180 feet) above the ground level, it is self-evident that no hazard from radiation will exist to persons at ground level. At approximately 2 meters above the ground and assuming maximum downward radiation, the proposed FM facility contributes 3.5% of the FCC “controlled” standard.

Figure 6 is a vertical elevation plot for an ERI 2 bay half-wave spaced FM antenna (LPX-2E-HW).

Figure 6-A is a plot of the predicted RF Exposure at 7 feet above ground level. The “solid” line assumes a vertical form factor of  $F=1.0$  while the “dashed” line uses the vertical form factor from Figure 6. As can be seen, the use of the 2 bay half-wave spaced FM antenna reduced the exposure at ground level below 4  $\mu\text{W}/\text{sq.cm}$  or 0.4 percent of the standard for a “controlled” area. For FM, the “un-controlled” standard is 20% and therefore, this proposal is in full compliance and is categorically excluded from further consideration since it is less than 5% of either the controlled or un-controlled standard.

The area is surrounded by a locked fence to limit access.

Workers employed to climb the tower or work in a potential overexposure location will not be permitted to enter the work area until cleared by the station manager or other responsible person. It is recognized that maintenance or installation work on or near the antenna may require the station to completely shutdown or switch temporarily to an auxiliary antenna or an auxiliary transmitter site. In the instance of a multiple use site, a single site access policy incorporating the above philosophy will be established. All procedures will be reviewed & updated as necessary.

**J. Coordination with Radio Astronomy and Receiving Installations:**

The proposed site is located well beyond the 80 km coordination distance specified by Section 73.1030.

**III. SUMMARY:**

Optima Communications, Inc., herein amends its pending upgrade application to specify C2 facilities. KSKX(FM) proposes to operate on Channel 288C2 at Security, Colorado. The application is contingent upon a channel substitution at Genoa, CO. In all other respects this engineering proposal is in full compliance with the Commission's Rules.

/s/ John J. Mullaney

John J. Mullaney, Consulting Engineer

October 27, 2003.