

**MINOR CHANGE APPLICATION**  
**CUMULUS LICENSING LLC**  
**KBKL (FM) RADIO STATION**  
**CH 300C - 107.9 MHZ - 100.0 KW**  
**GRAND JUNCTION, COLORADO**  
**November 2010**

**EXHIBIT C**

**Radio Frequency Assessment**

A study has been made to determine whether this proposal is in compliance with 47 C.F.R. §1.1307 of the Commission's rules and with OET Bulletin #65, dated August 1997 ("Bulletin"), regarding human exposure to radio frequency radiation in the vicinity of broadcast towers. As the proposed KBKL is co-located with other FM and TV stations, it was not possible to use the worksheets to verify that the proposed KBKL facility is in compliance with the Commission's radio frequency exposure limits. This study considers all nearby stations<sup>1</sup>, each of which is addressed below, and utilizes the appropriate formulas contained in the OET Bulletin.<sup>2</sup>

The KBKL antenna system is installed on an existing tower at the Black Ridge Electronics site at which numerous towers are located. The site is controlled by the Bureau of Land Management which has installed a gate across the access road leading to the top of the mountain, where the broadcast facilities are located. The gate is located on the west side of the hill, approximately 1.0 mile (1,600 meters) below the actual site. This gate is locked to prevent

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- 1) Only KBKL, KEKB and KMXV are located on the same tower, all other facilities reviewed herein are on nearby towers that are within 292 meters of the KBKL tower.
  - 2) The contributions of the FM facilities were calculated using the FMModel program. A single bay EPA dipole antenna was used for calculation purposes. In cases where the number of bays of the antenna was known, this data was used in the FMModel program.

casual trespass by the general public to the site. This is the only access to the site due to the rugged nature of the terrain. Warning signs are posted at the gate warning of potential radio frequency radiations hazards at the site. Therefore, the uncontrolled limits are calculated at the gated access point.<sup>3</sup>

The existing KBKL antenna system is mounted with its center of radiation 73.2 meters (240.0 feet) above the ground at the tower location and operates with an effective radiated power of 100.0 kilowatts in the horizontal and vertical planes (circularly polarized). The KBKL antenna is a Jampro JHCP-8 eight bay full wavelength spaced antenna (FCC/EPA Type 2). At 2.0 meters above the ground at the base of the tower, the height of an average person, the KBKL antenna system contributes 0.1313 mw/cm<sup>2</sup>.<sup>4</sup> Based on exposure limitations for a controlled environment, 13.1% of the allowable limit is reached at 2.0 meters above the ground at the base of the tower. At the gated access point, 1,600 meters from the tower, the KBKL antenna system contributes 0.0017 mw/cm<sup>2</sup> or 0.2% of the allowable limit for an uncontrolled environment.

The KMXV antenna system is mounted with its center of radiation 73.2 meters (240.0 feet) above the ground at the tower location and operates with an effective radiated power of 100.0 kilowatts in the horizontal and vertical planes (circularly polarized). The KMXV antenna is a Jampro JHCP-8 eight bay full wavelength spaced antenna (FCC/EPA Type 2). At 2.0 meters above the ground at the base of the tower, the height of an average person, the KMXV

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- 3) All TV contributions are the controlled value limits, which are worst case figures, based on distance to gate and elevation drop.
  - 4) This level of field occurs at 17.0 meters out from the base of the tower and is considered worst case.

antenna system contributes  $0.1312 \text{ mw/cm}^2$ .<sup>5</sup> Based on exposure limitations for a controlled environment, 13.1% of the allowable limit is reached at 2.0 meters above the ground at the base of the tower. At the gated access point, 1,600 meters from the tower, the KMXV antenna system contributes  $0.0017 \text{ mw/cm}^2$  or 0.2% of the allowable limit for an uncontrolled environment.

The KEKB antenna system is mounted with its center of radiation 98.0 meters (321.5 feet) above the ground at the tower location and operates with an effective radiated power of 79.0 kilowatts in the horizontal and vertical planes (circularly polarized). The KEKB antenna is a Jampro JSCP-6 six bay full wavelength spaced antenna (FCC/EPA Type 2). At 2.0 meters above the ground at the base of the tower, the height of an average person, the KEKB antenna system contributes  $0.0636 \text{ mw/cm}^2$ .<sup>6</sup> Based on exposure limitations for a controlled environment, 6.4% of the allowable limit is reached at 2.0 meters above the ground at the base of the tower. At the gated access point, 1,600 meters from the tower, the KEKB antenna system contributes  $0.0014 \text{ mw/cm}^2$  or 0.1% of the allowable limit for an uncontrolled environment.

The KLFV antenna system is mounted with its center of radiation 26.0 meters (85.3 feet) above the ground at the tower location, which is 100 meters from the base of the KBKL tower, and operates with an effective radiated power of 3.0 kilowatts in the horizontal and vertical planes (circularly polarized). The KLFV antenna is a SWR FM3/6 6 bay full wave spaced antenna (FCC/EPA Type 2).<sup>7</sup> At 2.0 meters above the ground at the base of the tower, the height

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- 5) This level of field occurs at 17.0 meters out from the base of the tower and is considered worst case.
  - 6) This level of field occurs at 28.0 meters out from the base of the tower and is considered worst case.
  - 7) The SWR antenna system is a duplicate of the Jampro double V style.

of an average person, the KLFV antenna system contributes  $0.0011 \text{ mw/cm}^2$ .<sup>8</sup> Based on exposure limitations for a controlled environment, 0.1% of the allowable limit is reached at 2.0 meters above the ground at the base of the tower. At the gated access point, 1,600 meters from the tower, the KLFV antenna system contributes  $<0.00007 \text{ mw/cm}^2$  or  $<0.1\%$  of the allowable limit for an uncontrolled environment.

The authorized KMSA<sup>9</sup> antenna system will be mounted with its center of radiation 32.6 meters (107.0 feet) above the ground at the KBKL tower location, and will operate with an effective radiated power of 3.1 kilowatts in the horizontal and vertical planes (circularly polarized). The KMSA antenna is a Shively 6813 four bay full wavelength antenna system (FCC/EPA Type 6).<sup>10</sup> At 2.0 meters above the ground at the base of the tower, the height of an average person, the KMSA antenna system contributes  $0.0162 \text{ mw/cm}^2$ . At the gated access point, 1,600 meters from the tower, the KMSA antenna system contributes  $<0.00007 \text{ mw/cm}^2$  or  $<0.1\%$  of the allowable limit for an uncontrolled environment.

The KMGJ antenna system is mounted with its center of radiation 59.0 meters (193.6 feet) above the ground at the tower location, which is located 280 meters from the KBKL tower, and operates with an effective radiated power of 100.0 kilowatts in the horizontal and vertical planes (circularly polarized). The KMGJ antenna is a Jampro JHPC 8, eight bay full wavelength antenna system (FCC/EPA Type 2). At 2.0 meters above the ground at the base of the tower, the

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8) This level of field occurs at 7.0 meters out from the base of the tower and is considered worst case.

9) The KMSA CP is on the KBKL tower. As such, the permit will be used as a worse case scenario.

10) This level of field occurs at 14.0 meters out from the base of the tower and is considered worst case.

height of an average person, the KMGJ antenna system contributes  $0.0034 \text{ mw/cm}^2$ . At the gated access point, 1,600 meters from the tower, the KMGJ antenna system contributes  $0.0020 \text{ mw/cm}^2$  or 0.2% of the allowable limit for an uncontrolled environment.

The KPRN antenna system is mounted with its center of radiation 37.0 meters (121.4 feet) above the ground at the tower location, which is located 225 meters from the KBKL tower, and operates with an effective radiated power of 20.0 kilowatts in the horizontal and vertical planes (circularly polarized). The KPRN antenna is a Electronics Research SHPX-4, four bay full wavelength antenna system (FCC/EPA Type 3). At 2.0 meters above the ground at the base of the tower, the height of an average person, the KPRN antenna system contributes  $0.0065 \text{ mw/cm}^2$ . At the gated access point, 1,600 meters from the tower, the KPRN antenna system contributes  $0.0005 \text{ mw/cm}^2$  or  $<0.1\%$  of the allowable limit for an uncontrolled environment.

The authorized KAFM<sup>11</sup> antenna system is mounted with its center of radiation 15.0 meters (49.2 feet) above the ground at the tower location, which is located 292 meters from the KBKL tower, and will operate with an effective radiated power of 0.30 kilowatt in the horizontal and vertical planes (circularly polarized). At 2.0 meters above the ground at the base of the tower, the height of an average person, the KAFM antenna system contributes  $0.0002 \text{ mw/cm}^2$ . At the gated access point, 1,600 meters from the tower, the KAFM antenna system contributes  $0.000008 \text{ mw/cm}^2$  or  $<0.1\%$  of the allowable limit for an uncontrolled environment.

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11) Since the permit for KAFM is authorized at 0.30 kW at the same height as the licensed KAFM which operates with 0.016 kW, the KAFM permit was used as a worst case scenario.

The KJYE antenna system is mounted with its center of radiation 58.0 meters (190.3 feet) above the ground at the tower location, which is located 292 meters from the KBKL tower, and operates with an effective radiated power of 100.0 kilowatts in the horizontal and vertical planes (circularly polarized). At 2.0 meters above the ground at the base of the tower, the height of an average person, the KJYE antenna system contributes 0.0732 mw/cm<sup>2</sup>. At the gated access point, 1,600 meters from the tower, the KJYE antenna system contributes 0.0026 mw/cm<sup>2</sup> or 0.3% of the allowable limit for an uncontrolled environment.

The KRZX antenna system is mounted with its center of radiation 23.0 meters (75.5 feet) above the ground at the tower location, which is located 292 meters from the KBKL tower, and operates with an effective radiated power of 1.55 kilowatts in the horizontal and vertical planes (circularly polarized). The KRZX antenna is a single bay Shively 6813 (FCC/EPA Type 6). At 2.0 meters above the ground at the base of the tower, the height of an average person, the KRZX antenna system contributes 0.0012 mw/cm<sup>2</sup>. At the gated access point, 1,600 meters from the tower, the KRZX antenna system contributes 0.00004 mw/cm<sup>2</sup> or <0.1% of the allowable limit for an uncontrolled environment.

The KMOZ-FM antenna system is mounted with its center of radiation 97.0 meters (318.2 feet) above the ground at the tower location, which is located 280 meters from the KBKL tower, and operates with an effective radiated power of 30.0 kilowatts in the horizontal and vertical planes (circularly polarized). At 2.0 meters above the ground at the base of the tower,

the height of an average person, the KMOZ-FM antenna system contributes  $0.0218 \text{ mw/cm}^2$ .

At the gated access point, 1,600 meters from the tower, the KMOZ-FM antenna system contributes  $0.0008 \text{ mw/cm}^2$  or  $<0.1\%$  of the allowable limit for an uncontrolled environment.

The authorized KDVC antenna system will be mounted with its center of radiation 28.0 meters (91.9 feet) above the ground at the tower location, which is located 292 meters from the KBKL tower, and will operate with an effective radiated power of 3.8 kilowatts in the horizontal plane. At 2.0 meters above the ground at the base of the tower, the height of an average person, the KDVC antenna system will contribute  $0.0015 \text{ mw/cm}^2$ . At the gated access point, 1,600 meters from the tower, the KDVC antenna system contributes  $0.00005 \text{ mw/cm}^2$  or  $<0.1\%$  of the allowable limit for an uncontrolled environment.

The K229AH antenna system is mounted with its center of radiation 92.0 meters (301.8 feet) above the ground at the tower location, which is located 225 meters from the KBKL tower, and operates with an effective radiated power of 0.01 kilowatt in the horizontal and vertical planes (circularly polarized). At 2.0 meters above the ground at the base of the tower, the height of an average person, the K229AH antenna system contributes  $0.00001 \text{ mw/cm}^2$ . At the gated access point, 1,600 meters from the tower, the K229AH antenna system contributes  $<0.00001 \text{ mw/cm}^2$  or  $<0.1\%$  of the allowable limit for an uncontrolled environment.

The K258BP antenna system is mounted with its center of radiation 33.0 meters (108.3 feet) above the ground at the tower location, which is located 280 meters from the KBKL tower,

and operates with an effective radiated power of 0.25 kilowatt in the vertical plane only. At 2.0 meters above the ground at the base of the tower, the height of an average person, the K258BP antenna system contributes  $0.0001 \text{ mw/cm}^2$ . At the gated access point, 1,600 meters from the tower, the K258BP antenna system contributes  $<0.000001 \text{ mw/cm}^2$  or  $<0.1\%$  of the allowable limit for an uncontrolled environment.

The K284AP antenna system is mounted with its center of radiation 75.0 meters (246.1 feet) above the ground at the tower location, which is located 292 meters from the KBKL tower, and operates with an effective radiated power of 0.01 kilowatt in the horizontal and vertical planes (circularly polarized). At 2.0 meters above the ground at the base of the tower, the height of an average person, the K284AP antenna system contributes  $<0.0001 \text{ mw/cm}^2$ . At the gated access point, 1,600 meters from the tower, the K284AP antenna system contributes  $<0.000001 \text{ mw/cm}^2$  or  $<0.1\%$  of the allowable limit for an uncontrolled environment.

The K250AO antenna system is mounted with its center of radiation 9.0 meters (29.5 feet) above the ground at the tower location, which is located 292 meters from the KBKL tower, and operates with an effective radiated power of 0.01 kilowatt in the horizontal and vertical planes (circularly polarized). At 2.0 meters above the ground at the base of the tower, the height of an average person, the K250AO antenna system contributes  $<0.00001 \text{ mw/cm}^2$ . At the gated access point, 1,600 meters from the tower, the K250AO antenna system contributes  $<0.000001 \text{ mw/cm}^2$  or  $0.1\%$  of the allowable limit for an uncontrolled environment.

The KZKS-FM1 antenna system is mounted with its center of radiation 24.0 meters (78.76 feet) above the ground at the tower location, which is located 292 meters from the KBKL tower, and operates with an effective radiated power of 20.0 kilowatts in the horizontal and vertical planes (circularly polarized). At 2.0 meters above the ground at the base of the tower, the height of an average person, the KZKS-FM1 antenna system contributes 0.0155 mw/cm<sup>2</sup>. At the gated access point, 1,600 meters from the tower, the KZKS-FM1 antenna system contributes 0.0005 mw/cm<sup>2</sup> or <0.1% of the allowable limit for an uncontrolled environment.

The K47JR Channel 47 antenna system is mounted with its center of radiation 18.0 meters (59.1 feet) above the ground at the tower location and operates with an effective radiated power of 0.976 kilowatt in the horizontal plane. At 2.0 meters above the ground at the base of the tower, the height of an average person, the K47JR antenna system contributes 0.0790 mw/cm<sup>2</sup>. Based on exposure limitations for a controlled environment, 3.5% of the allowable limit is reached at 2.0 meters above the ground at the base of the tower.

The K49IO Channel 49 antenna system is mounted with its center of radiation 18.0 meters (59.1 feet) above the ground at the tower location and operates with an effective radiated power of 0.976 kilowatt in the horizontal plane. At 2.0 meters above the ground at the base of the tower, the height of an average person, the K49IO antenna system contributes 0.0790 mw/cm<sup>2</sup>. Based on exposure limitations for a controlled environment, 3.5% of the allowable limit is reached at 2.0 meters above the ground at the base of the tower.

The K45IT Channel 45 antenna system is mounted with its center of radiation 14.0 meters (45.9 feet) above the ground at the tower location and operates with an effective radiated power of 0.976 kilowatt in the horizontal plane. At 2.0 meters above the ground at the base of the tower, the height of an average person, the K45IT antenna system contributes 0.1404 mw/cm<sup>2</sup>. Based on exposure limitations for a controlled environment, 6.4% of the allowable limit is reached at 2.0 meters above the ground at the base of the tower.

The authorized KFQX-DT Channel 15 antenna system will be mounted with its center of radiation 30.0 meters (98.4 feet) above the ground at the tower location and will operate with an effective radiated power of 71.5 kilowatts in the horizontal plane. As denoted in OET Bulletin #65, Supplement A, Page 31, the typical UHF antenna system has a downward radiation field of 0.1. As such, the KFQX-DT antenna system radio frequency radiation calculations were made based on an effective radiated power of 0.715 kilowatt. At 2.0 meters above the ground at the base of the tower, the height of an average person, the KFQX-DT antenna system will contribute 0.0122 mw/cm<sup>2</sup>. Based on exposure limitations for a controlled environment, 0.8% of the allowable limit is reached at 2.0 meters above the ground at the base of the tower.

The KKCO-DT Channel 12 antenna system is mounted with its center of radiation 89.0 meters (292.0 feet) above the ground at the tower location and will operate with an effective radiated power of 5.3 kilowatts (in the main beam) in the horizontal plane. At 2.0 meters above the ground at the base of the tower, the height of an average person, the KKCO-DT antenna

system will contribute  $0.0094 \text{ mw/cm}^2$ . Based on exposure limitations for a controlled environment, 0.9% of the allowable limit is reached at 2.0 meters above the ground at the base of the tower.

The KRMJ-DT Channel 18 antenna system is mounted with its center of radiation 46.0 meters (150.9 feet) above the ground at the tower location and operates with an effective radiated power of 21.0 kilowatts in the horizontal plane. As denoted in OET Bulletin #65, Supplement A, Page 31, the typical UHF antenna system has a downward radiation field of 0.1. As such, the KRMJ-DT antenna system radio frequency radiation calculations were made based on an effective radiated power of 0.210 kilowatt. At 2.0 meters above the ground at the base of the tower, the height of an average person, the KRMJ-DT antenna system will contribute  $0.0014 \text{ mw/cm}^2$ . Based on exposure limitations for a controlled environment, 0.1% of the allowable limit is reached at 2.0 meters above the ground at the base of the tower.

The K25FZ Channel 25 antenna system is mounted with its center of radiation 40.0 meters (131.2 feet) above the ground at the tower location and operates with an effective radiated power of 21.4 kilowatts in the horizontal plane. As denoted in OET Bulletin #65, Supplement A, Page 31, the typical UHF antenna system has a downward radiation field of 0.1. As such, the K25FZ antenna system radio frequency radiation calculations were made based on an effective radiated power of 0.204 kilowatt. At 2.0 meters above the ground at the base of the tower, the height of an average person, the K25FZ antenna system will contribute  $0.0031 \text{ mw/cm}^2$ . Based

on exposure limitations for a controlled environment, 0.2% of the allowable limit is reached at 2.0 meters above the ground at the base of the tower.

The authorized K33KY digital Channel 33 antenna system is mounted with its center of radiation 50.0 meters (164.0 feet) above the ground at the tower location and will operate with an effective radiated power of 2.0 kilowatt in the horizontal plane. At 2.0 meters above the ground at the base of the tower, the height of an average person, the K33KY antenna system will contribute  $0.0116 \text{ mw/cm}^2$ . Based on exposure limitations for a controlled environment, 0.6% of the allowable limit is reached at 2.0 meters above the ground at the base of the tower.

The authorized K22JN digital Channel 22 antenna system is mounted with its center of radiation 50.0 meters (164.0 feet) above the ground at the tower location and will operate with an effective radiated power of 4.0 kilowatt in the horizontal plane. At 2.0 meters above the ground at the base of the tower, the height of an average person, the K22JN antenna system will contribute  $0.0232 \text{ mw/cm}^2$ . Based on exposure limitations for a controlled environment, 1.3% of the allowable limit is reached at 2.0 meters above the ground at the base of the tower.

The authorized K53JX Channel 53 antenna system will be mounted with its center of radiation 40.0 meters (131.2 feet) above the ground at the tower location and will operate with an effective radiated power of 20.0 kilowatts in the horizontal plane. As denoted in OET Bulletin #65, Supplement A, Page 31, the typical UHF antenna system has a downward radiation field of

0.1. As such, the K53JX antenna system radio frequency radiation calculations were made based on an effective radiated power of 0.2 kilowatt. At 2.0 meters above the ground at the base of the tower, the height of an average person, the K53JX antenna system will contribute 0.0029 mw/cm<sup>2</sup>. Based on exposure limitations for a controlled environment, 0.1% of the allowable limit is reached at 2.0 meters above the ground at the base of the tower.

Combining the contributions of KBKL, KEKB, KMXV, KLFV, KMSA, KMGJ, KPRN, KAFM, KJYE, KRZX, KMOZ-FM, KDVC, K229AH, K258BP, K284AP, K250AO, KZKS-FM1, KFQX-DT, KKCO-DT, KRMJ-TV, K47JR, K45IT, K49IO, K25FZ, K33KY, K22JN and K53JX, the total for controlled environments is less than 65.2% of the limit for controlled environments. For uncontrolled environments, a total contribution of <2.0% is reached at the gated access point, 1,600 meters from the towers. It is believed the KBKL facility is in compliance with the radio frequency radiation exposure limits, as required by the Federal Communications Commission. Cumulus will also insure that warning signs have been posted at the access gate and in the vicinity of the tower warning of potential radio frequency radiation hazards at the site. In addition, Cumulus will reduce the power of the facility or cease operation in cooperation and coordination with other tower users, as necessary, to protect persons having access to the site, tower, or antenna from radio frequency radiation in excess of FCC guidelines.