

Engineering Exhibit
KRVK FM (Facility ID: 88406)
KWYY FM (Facility ID: 26300)
Intermodulation Report
October 24, 2007

Introduction: This report of findings is based on data collected to show compliance with FCC rules Title 47 section 73.317 paragraphs (b) through (d) for radio stations KRVK (107.9 MHz) and KWYY (95.5 MHz). Both stations are utilizing the same antenna in diplexed operations at the Clear Channel transmitter facility in Casper, Wyoming. This report includes measurements offered as proof that the combined operations of KRVK and KWYY transmitters are in compliance with FCC Rules and Regulations. In brief, the collection of measurements presented in this report shows that all possible third order inter-modulation (IM) products generated by the two transmitters using this diplex system are less than the maximum allowable level as required by section 73.317 (b) through (d). The measurements and report were prepared by Erik Kuhlmann, Regional Vice President of Engineering for Clear Channel Radio.

Intermodulation: Intermodulation products result from inadequate transmitter-to-transmitter isolation. Intermodulation products are commonly generated from radio stations operating into diplexed facilities and congested antenna broadcast sites. The mechanics associated with the phenomenon have been well documented. When two or more transmitters are coupled to each other, new spectral components are produced by the mixing of the station frequencies in the active circuits of each transmitter. The common term used to describe this phenomenon is third order product denoted by the mathematical expression $[2(F_1)-(F_2)]$, where F_1 signifies the frequency of the transmitter that is generating the inter-modulation product, and F_2 signifies the frequency causing the interference.

The Multiplexed System: At the time of the measurements two FM stations were operating from the combined antenna system. The 107.9 MHz KRVK FM and 95.5 MHz KWYY FM multiplexed system is fundamentally comprised of antenna, feed line and multiplexer unit. A Dielectric DCRM-10BAR 10-bay branch fed antenna and a Dielectric 2-port branch fed combiner system was designed specifically for this application. The feed line is Dielectric 4-1/8" air dielectric coax. This system was fitted with a Dielectric directional sampling coupler fitted into the output line section of the combining system and was used to facilitate intermodulation proof measurements.

Intermodulation Study: Prior to recording measurements, both stations were confirmed to be operating at the full licensed or permitted power level. All measurements were made utilizing the above-mentioned directional coupler using an Agilent 4402 spectrum analyzer connected to the directional coupler with a shielded coaxial cable. External attenuation is typically employed to ensure an adequate signal level for measurements without overloading the measurement equipment, though no external attenuation was

required in any of the measurements. The relative output signal of each stations forward carrier was recorded. The resulting signal levels of these measurements will be used as the reference level for each carrier and to confirm that no significant levels of spurious energy, referenced to each carrier, are present from any transmitter operating in the multiplexed system. Once the reference level was set on the analyzer, double-cavity notch filters model 6367-2 manufactured by the Microwave Filter Company, one for each station's carrier, were inserted in series into the line between the coupler and the analyzer. The reduction of the fundamental carrier level allows increased dynamic range on the analyzer. The fundamental signal levels were reduced by an additional -46 dB on 107.9MHz and -39dB on 95.5MHz while passing all other channels to be measured with no appreciable attenuation. Frequencies specifically observed and measured were determined by intermodulation study software. In addition, a thorough sweep was made of other frequencies in the 80 to 1200 MHz range with the analyzer.

Tabulation of measurements: The following is a tabulation of the results of this study. Several signals were discovered and all were identified. It is believed the observed signals were coming back down the transmission line from the common antenna. Other FM broadcast stations, paging and two-way communication carriers from nearby sites were also seen at this directional coupler port. To confirm, one of the two transmitters under study was turned off and the result observed on the analyzer. In no case did the signal in question diminish as a result therefore was not likely to originate from the measurement location. All signals (other than the fundamental frequencies) related to the two combined stations were less than the FCC limit of 80 dB below the unmodulated carrier level.

Adjusted Carrier Reference Levels:

<u>Carrier (MHz)</u>	<u>External Pad (dB)</u>	<u>Measured Value (dBm)</u>	<u>Adjusted Level (dBm)</u>
KRVK (107.9)	0	-24.25	-24.25
KWYY (95.5)	0	-13.94	-13.94

Third Order Products:

<u>Frequency (MHz)</u>	<u>External Pad (dB)</u>	<u>Measured Value (dBm)</u>	<u>Level Referenced to Carrier (dBm)</u>
83.100	0	Below noise floor/Not measurable	
120.300	0	Below noise floor/Not measurable	

Conclusion: Based upon measurements taken on October 22, 2007 as summarized in this document, I, Erik Kuhlmann, find the subject system, specifically the transmitter and filter system for the operation of KRVK and KWYY into the antenna, to be in proper working order. Furthermore, based on the calculated and measured data, it is my opinion that there are no inter-modulation products in excess of 80 dB below carrier levels generated from or within the stations operating on the installed system. Based on this recorded data, I conclude that KRVK and KWYY comply with the requirements of Section 73.317 paragraph (b) through (d) of the FCC Rules and Regulations.