

# **ENGINEERING REPORT**

## **Spurious Emissions Measurement Study Pursuant to 47 C.F.R. §73.317(b)-(d)**

associated with the licensing of

**KJOE(FM).C (Fac ID: 70736)**

**Slayton, MN**

**BPH-20150922ACB**

**&**

**KISD(FM).C (Fac ID: 70738)**

**Pipestone, MN**

**BPH-20150922ACC**

December, 2015

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# **RF Signal Spurious Emissions Study for the Combined Master Antenna of KJOE(FM).C - Slayton, MN & KISD(FM).C - Pipestone, MN**

This firm has been retained to prepare the required engineering report in support of this Spurious Emissions Measurement Study for the di-plexed operation of FM Station(s) KJOE(FM).C - Slayton, MN and KISD(FM).C - Pipestone, MN onto Antenna Structure Registration Tower Number 1003305. This study has been conducted pursuant to 47 C.F.R. §73.317(b)-(d) and is associated with, and a condition of licensing for, KJOE(FM).C Construction Permit BPH-20150922ACB and KISD(FM).C Construction Permit BPH-20150922ACC.

KJOE(FM).C operates on 106.1 MHz with a maximum effective radiated power (ERP) of 10.0 kW circular (H&V) polarization. KISD(FM).C operates on 98.7 MHz with a maximum effective radiated power (ERP) of 100.0 kW circular (H&V) polarization. As stated before, the common antenna is mounted on the tower bearing ASR #1003305. The common FM antenna is a six-bay, Dielectric (DIE) DCRM-6-DC, "Double Helix" antenna mounted with a Center of Radiation 295 meters above ground level (AGL). The antenna is matched with a Dielectric Model DCF24003BR2 Branch Combiner (diplexer). The diplexer was set using manufacturer specifications as well as information from the FCC database concerning the KJOE(FM).C and KISD(FM).C operating parameters.

RF signal purity measurements were conducted on November 16, 2015 during the equipment test operations associated with KJOE(FM).C Construction Permit BPH-20150922ACB and KISD(FM).C Construction Permit BPH-20150922ACC. Measurements were conducted by Mark Persons of M. W. Persons and Associates, Inc., contracted engineers in the employ of the KJOE(FM) and KISD(FM). Mr. Persons conducted his measurements utilizing an Agilent N9340B Spectrum Analyzer, Serial Number CN03480692, with the FM transmitters in full operation employing the Dielectric Branch Combiner (diplexer) for the dual FM Translator operations. A broad spectral sweep found no obvious products above the analyzer noise floor. Using a computer generated mixing product chart, high resolution, low noise floor measurements were also made out to the 1st, 2nd and 3rd order. With the exception of noted carrier frequencies, nothing was observed over the noise floor of the analyzer as reported in the **Exhibit A** attachment.

Attached as **Exhibit A** is a copy of the 1st, 2nd and 3rd order potential mixing product measurement results for the spurious relationships associated with the 98.7 MHz and 106.1 MHz di-plexed operations. As a result of these studies, it has been concluded the proposed di-plexed operation of KJOE(FM).C and KISD(FM).C, meets or exceeds the requirements of 47 C.F.R. §73.317(b)-(d) and the special condition of licensing associated with KJOE(FM).C Construction Permit BPH-20150922ACB and KISD(FM).C Construction Permit BPH-20150922ACC.

## **CERTIFICATION OF ENGINEER**

The data utilized in this report was taken from the FCC Secondary Database and data on file. While this information is believed accurate, errors or omissions in the database and file data are possible. This firm may not be held liable for damages as a result of such data errors or omissions.

The report has been prepared by properly trained electronics specialists under the direction of the undersigned whose qualifications are a matter of record before the Federal Communications Commission.

I declare under penalty of the laws of perjury that the contents of this report are true and accurate to the best of my knowledge and belief.

December 10, 2015

By   
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## **Exhibit A - Tabulation of Potential Mixing Products**

KISD(FM).C - (98.7 MHz) - 100 kW (ERP); Minimum Attenuation Level: 80 dBc					
KJOE(FM).C - (106.1 MHz) - 10 kW (ERP); Minimum Attenuation Level: 80 dBc					
Frequency (MHz)	Measured Level (dBc)		Frequency (MHz)	Measured Level (dBc)	
7.4 MHz	< -82 dBc		120.9 MHz	< -85 dBc	
14.8 MHz	< -82 dBc		190.0 MHz	< -88 dBc	
22.2 MHz	< -82 dBc		197.4 MHz	< -86 dBc	
83.9 MHz	< -82 dBc		204.8 MHz	< -85 dBc	
91.3 MHz	< -82 dBc		212.2 MHz	< -88 dBc	
98.7 MHz	<i>KISD(FM) Carrier</i>		219.6 MHz	< -90 dBc	
106.1 MHz	<i>KJOE(FM) Carrier</i>		296.1 MHz	< -90 dBc	
113.5 MHz	< -81 dBc		303.5 MHz	< -90 dBc	
*No intermodulation mixing was noted on any carrier frequencies.					

Title 47: Telecommunication: PART 73—RADIO BROADCAST SERVICES Subpart B—FM Broadcast Stations § 73.317 FM transmission system requirements.

(a) FM broadcast stations employing transmitters authorized after January 1, 1960, must maintain the bandwidth occupied by their emissions in accordance with the specification detailed below. FM broadcast stations employing transmitters installed or type accepted before January 1, 1960, must achieve the highest degree of compliance with these specifications practicable with their existing equipment. In either case, should harmful interference to other authorized stations occur, the licensee shall correct the problem promptly or cease operation.

(b) Any emission appearing on a frequency removed from the carrier by between 120 kHz and 240 kHz inclusive must be attenuated at least 25 dB below the level of the unmodulated carrier. Compliance with this requirement will be deemed to show the occupied bandwidth to be 240 kHz or less.

(c) Any emission appearing on a frequency removed from the carrier by more than 240 kHz and up to and including 600 kHz must be attenuated at least 35 dB below the level of the unmodulated carrier.

(d) Any emission appearing on a frequency removed from the carrier by more than 600 kHz must be attenuated at least  $43 + 10 \log_{10}(\text{Power, in watts})$  dB below the level of the unmodulated carrier, or 80 dB, whichever is the lesser attenuation.

(e) Preemphasis shall not be greater than the impedance-frequency characteristics of a series inductance resistance network having a time constant of 75 microseconds. (See upper curve of Figure 2 of §73.333.) [51 FR 17028, May 8, 1986]

Title 47: Telecommunication: PART 74—EXPERIMENTAL RADIO, AUXILIARY, SPECIAL BROADCAST AND OTHER SERVICES Subpart L—FM Broadcast Translator Stations and FM Broadcast Booster Stations: § 74.1236 Emission and bandwidth.

(a) The license of a station authorized under this subpart allows the transmission of either F3 or other types of frequency modulation (see §2.201 of this chapter) upon a showing of need, as long as the emission complies with the following:

(1) For transmitter output powers no greater than 10 watts, paragraphs (b), (c), and (d) of this section apply.

(2) For transmitter output powers greater than 10 watts, §73.317 (a), (b), (c), and (d) apply.

(b) Standard width FM channels will be assigned and the transmitting apparatus shall be operated so as to limit spurious emissions to the lowest practicable value. Any emissions including intermodulation products and radiofrequency harmonics which are not essential for the transmission of the desired aural information shall be considered to be spurious emissions.

(c) The power of emissions appearing outside the assigned channel shall be attenuated below the total power of the emission as follows:

Distance of emission from center frequency	Minimum attenuation below unmodulated carrier
120 to 240 kHz	KISD = 34 dB, KJOE = 36 dB 25 dB
Over 240 and up to 600 kHz	KISD = 68 dB, KJOE = 69 dB 35 dB
Over 600 kHz	KISD = 80 dB, KJOE = 81 dB 60 dB

(d) Greater attenuation than that specified in paragraph (c) of this section may be required if interference results outside the assigned channel.

[35 FR 15388, Oct. 2, 1970, as amended at 52 FR 31406, Aug. 20, 1987; 55 FR 50698, Dec. 10, 1990]