

# **ENGINEERING REPORT**

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

associated with the licensing of

**K238BA.C (Fac ID: 148217)**

**Mitchell, SD**

BPFT-20141001CCH

&

**K278BJ.C (Fac ID: 142012)**

**Mitchell, SD**

BPFT-20141001CCF

April, 2015

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# **RF Signal Spurious Emissions Study for the Combined Master Antenna of K238BA.C - Mitchell, SD & K278BJ.C - Mitchell, SD**

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 Translator(s) K238BA.C - Mitchell, SD and K278BJ.C - Mitchell, SD onto Antenna Structure Registration Tower Number 1205757. 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, K238BA.C Construction Permit BPFT-20141001CCH and K278BJ.C Construction Permit BPFT-20141001CCF.

K238BA.C operates on 95.5 MHz with a maximum effective radiated power (ERP) of 0.250 kW circular (H&V) polarization. K278BJ.C operates on 103.5 MHz with a maximum effective radiated power (ERP) of 0.250 kW circular (H&V) polarization. As stated before, the common antenna is mounted on the tower bearing ASR #1205757. The common FM antenna is a one (1) bay Nicom BKG/77-1(NDA) "Crossed V" antenna mounted with a Center of Radiation 78 meters above ground level (AGL). The antenna is matched with a Microwave Filter Company Model #19169 FM Diplexer. The Diplexer was set using manufacturer specifications as well as information from the FCC database concerning the K238BA.C and K278BJ.C operating parameters.

RF signal purity measurements were conducted on April 29th, 2015 during the equipment test operations associated with K238BA.C Construction Permit BPFT-20141001CCH and K278BJ.C Construction Permit BPFT-20141001CCF. Measurements were conducted by Mr. Marc E. Roost and Mr. Troy Manning of Calhoun Communications, Inc., contracted engineers in the employ of Saga Communications of South Dakota, LLC. Mr. Roost and Mr. Manning conducted their measurements utilizing a HP Model 4404E Spectrum Analyzer, serial number US39390329, with the FM transmitters in full operation employing the Microwave Filter Company FM 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 95.5 MHz and 103.5 MHz diplexed operations. As a result of these studies, it has been concluded the proposed diplexed operation of K238BA.C and K278BJ.C, meets or exceeds the requirements of 47 C.F.R. §73.317(b)-(d) and the special condition of licensing associated with K238BA.C Construction Permit BPFT-20141001CCH and K278BJ.C Construction Permit BPFT-20141001CCF.

## **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.

April 30, 2015

By   
Justin W. Asher, Staff Engineer

**MUNN-REESE, INC.**  
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# Exhibit A - Tabulation of Potential Mixing Products K238BA.C (95.5 MHz) & K278BJ.C (103.5 MHz)

K238BA Carrier was set to 806 watts. K278BJ Carrier was set to 808 watts.  
Levels were measured to be of nominally equal amplitude as measured at the output of  
the Filter Combiner and are the Zero Reference for the below measurements.  
Noise Floor was measured at -118.84 dBc

Frequency (MHz)	Measured Level (dBc)	Frequency (MHz)	Measured Level (dBc)	Frequency (MHz)	Measured Level (dBc)
8.0 MHz	-100.61	119.5 MHz	-116.04	302.5 MHz	-109.23
16.0 MHz	-117.34	183.0 MHz	-118.24	310.5 MHz	-115.44
24.0 MHz	-118.24	191.0 MHz	-100.87	390.0 MHz	-118.74
79.5 MHz	-113.64	199.0 MHz	-94.18	398.0 MHz	-118.74
87.5 MHz	-90.66	207.0 MHz	-98.34	406.0 MHz	-118.54
95.5 MHz	<i>K238BA Carrier</i>	215.0 MHz	-117.54	493.5 MHz	-118.84
103.5 MHz	<i>K278BJ Carrier</i>	286.5 MHz	-111.94	501.5 MHz	-118.84
111.5 MHz	-97.97	294.5 MHz	-107.11	597.0 MHz	-118.84

\*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<sub>10</sub>(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	25 dB
Over 240 and up to 600 kHz	35 dB
Over 600 kHz	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]