

Technical Engineering Report

SPURIOUS EMISSIONS MEASUREMENTS STUDY

Pursuant to 47 C.F.R. §73.317(b) associated with the licensing of:

*K245DA.C - Yankton, SD
BNPFT-20180418AEM
(FAC ID: 202251)*

*K260BO.L - Yankton, SD
BLFT-20111019AHW
(FAC ID: 154848)*

*&
WNAX-FM(auxiliary) - Yankton, SD
BXPB-20180709AAS
(FAC ID: 57839)*

August 2018

EXPLANATION OF STUDY: The applicant has prepared the required Spurious Emissions Measurement Study for the triplexed operation of FM Translator(s) K245DA.C - Yankton, SD, K260BO.L - Yankton, SD; and the auxiliary operation of FM Station WNAX-FM.C - Yankton, SD. This study has been conducted pursuant to 47 C.F.R. §73.317(b) and is associated with, and a condition of licensing for, K245DA.C Construction Permit File Number BNPFT-20180418AEM and WNAX-FM.C Auxiliary Construction Permit File Number BXPB-20180709AAS.

SUMMARY OF STATIONS: K245DA.C operates on 96.9 MHz with a maximum effective radiated power (ERP) of 0.250 kW circular polarization (H&V). K260BO.L operates on 99.9 MHz with a maximum effective radiated power (ERP) of 0.250 kW circular polarization (H&V). WNAX-FM.C Auxiliary operates on 104.1 MHz with a maximum effective radiated power of 0.255 kW circular polarization (H&V). The common antenna is mounted on the tower bearing Antenna Structure Registration Number 1035330. The common FM antenna is a two (2) bay, Nicom BKG77 "Opposed V Dipole" non-directional antenna mounted with a Center of Radiation 279 meters above ground level (AGL). The antenna is matched with a Nicom Model TFST 1000 Starpoint Combiner. The combiner was set using manufacturer specifications as well as information from the FCC database concerning the above mentioned operating parameters.

MEASUREMENT RESULTS: RF Spurious Emissions Measurements were conducted on August 30, 2018 during the equipment test operations associated with the aforementioned Construction Permits. Measurements were conducted by Mr. Troy Manning, a subcontracted engineer for the common licensee, Saga Communications of South Dakota, LLC. Measurements were conducted utilizing an Agilent Field Fox 9912A Spectrum Analyzer, Serial Number #MY49322218 with the FM transmitters in full operation employing the combiner for the multiple FM 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 through 3rd orders. With the exception of noted carrier frequencies, nothing was observed over the noise floor of the analyzer as reported at the end of this report.

The following is a copy of the 1st through 3rd order potential mixing product measurement results for the spurious relationships associated with the 96.9 MHz, 99.9 MHz and 104.1 MHz common operations. As a result of these studies, it has been concluded the combined operation(s) meets or exceeds the requirements of 47 C.F.R. §73.317(b) and the special conditions of licensing associated for K245DA.C Construction Permit File Number BNPFT-20180418AEM and WNAX-FM.C Auxiliary Construction Permit File Number BXPB-20180709AAS.

RF Signal Spurious Emissions Study

For a K245DA.C operational power of 0.250 kW, the minimum attenuation level is -67 dBc.
For a K260BO.L operational power of 0.250 kW, the minimum attenuation level is -67 dBc.
For a WNAX-FM.C auxiliary power of 0.255 kW, the minimum attenuation level is -67 dBc.

Frequency (in MHz)	Measurement (in dBc)	Frequency (in MHz)	Measurement (in dBc)	Frequency (in MHz)	Measurement (in dBc)
3.00 MHz	-67.99 dBc	196.80 MHz	-69.02 dBc	399.60 MHz	-91.52 dBc
4.20 MHz	-68.53 dBc	199.80 MHz	-70.00 dBc	402.00 MHz	-92.01 dBc
6.00 MHz	-88.55 dBc	201.00 MHz	-71.68 dBc	408.00 MHz	-91.67 dBc
7.20 MHz	-70.10 dBc	204.00 MHz	-70.18 dBc	416.40 MHz	-90.49 dBc
8.40 MHz	-89.83 dBc	208.20 MHz	-81.92 dBc		
14.40 MHz	-92.88 dBc	290.70 MHz	-92.82 dBc		
89.70 MHz	-81.99 dBc	293.70 MHz	-87.78 dBc		
93.90 MHz	-82.82 dBc	296.70 MHz	-90.86 dBc		
95.70 MHz	-80.77 dBc	297.90 MHz	-91.63 dBc		
96.90 MHz	K245DA.C Carrier*	299.70 MHz	-84.90 dBc		
99.90 MHz	K260BO.L Carrier*	303.90 MHz	-91.54 dBc		
102.90 MHz	-77.90 dBc	305.10 MHz	-90.85 dBc		
104.10 MHz	WNAX-FM.C Carrier*	308.10 MHz	-92.18 dBc		
108.30 MHz	-85.34 dBc	312.30 MHz	-92.49 dBc		
111.30 MHz	-87.34 dBc	387.60 MHz	-92.40 dBc		
193.80 MHz	-76.81 dBc	393.60 MHz	-90.97 dBc		

***No intermodulation mixing was noted on any Carrier frequency**

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 Log10(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:
- (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]

§ 74.1236 (c) Attenuations:	
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

CERTIFICATION OF TECHNICAL CONSULTANT: I declare, under penalty of perjury, that the contents of this report are true and accurate to the best of my knowledge and belief. I further certify I have over nineteen years of experience as a broadcast technical consultant before the Federal Communications Commission ("the FCC"); and am familiar with the Code of Federal Regulations Title 47 ("the Rules") as pertaining to this report and its contents herein. The underlying data utilized in this report was taken directly from FCC databases or indirectly through third party software vendors securing data directly from FCC databases. The information contained herein is believed accurate to the date reported below.

Justin W. Asher

Justin W. Asher, Technical Consultant
 August 31, 2018