

Technical Engineering Report

SPURIOUS EMISSIONS MEASUREMENTS STUDY

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

*KMOR(FM).C - Gering, NE
LMS(CP)-0000100422
(FAC ID: 67473)*

*KNEB-FM.C - Scottsbluff, NE
LMS(CP)-0000150145
(FAC ID: 51462)*

*KOZY-FM.L - Bridgeport, NE
BLH-20010827AAD
(FAC ID: 81766)*

*KHYY(FM).C - Minatare, NE
LMS(CP)-0000100427
(FAC ID: 164136)*

September 2022

EXPLANATION OF STUDY: The applicant has prepared the required Spurious Emissions Measurement Study for the quad-plexed operation of FM Station(s) KMOR(FM) - Gering, NE (Facility ID: 67473); KNEB-FM - Scottsbluff, NE (Facility ID: 51462); KOZY-FM - Bridgeport, NE (Facility ID: 81766); and KHYY(FM) - Minatare, NE (Facility ID: 164136). This study has been conducted pursuant to 47 C.F.R. Section 73.317(b) and is associated with, and a condition of licensing for KMOR(FM).C - Gering, NE Construction Permit File No LMS(CP)-0000100422; KNEB-FM.C - Scottsbluff, NE Construction Permit File Number LMS(CP)-0000150145; KOZY-FM.L - Bridgeport, NE License Modification File Number BLH-20010827AAD; and KHYY(FM).C - Minatare, NE Construction Permit File Number LMS(CP)-0000100427.

SUMMARY OF STATIONS: The authorized KMOR(FM).C - Gering, NE facility operates on CH227C0 (93.3 MHz) with 100.0 kW ERP circular polarization (H&V). The authorized KNEB-FM.C - Scottsbluff, NE facility operates on CH231C1 (94.1 MHz) with 75.0 kW ERP circular polarization (H&V). The licensed KOZY-FM.L - Bridgeport, NE facility operates on CH267C0 (101.3 MHz) with 100.0 kW ERP circular polarization (H&V). The authorized KHYY(FM).C - Minatare, NE facility operates on CH297C0 (107.3 MHz) with 100.0 kW ERP circular polarization (H&V). The common antenna is mounted on the tower bearing Antenna Structure Registration Number 1218350. The common FM antenna is a twenty (20) bay, Jampro model JCPB-20HR-.5RFR antenna employing EPA Type 2 "Opposed V Dipole" elements, mounted with a Center of Radiation 137 meters above ground level (AGL). The antenna is matched with a Jampro Model RCCC-621-FM3H / RCCS-633-2.0H Constant Impedance 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 September 14, 2022 during the equipment test operations associated with the aforementioned Construction Permits. Measurements were conducted by Xenirad Broadcast Engineering, LLC engineer Fred Francis Jr, a third-party engineer subcontracted by the common licensee, the Nebraska Rural Radio Association. Measurements were conducted utilizing a Rohde-Schwarz Model FSH3-TV spectrum analyzer; employing a Chriss Scott and Associates 175 MHz High Pass Filter for frequencies above 175 MHz. All measurements were done with the FM transmitters in full operation employing the combiner for the multiple FM operation. 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 noted 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 93.3 MHz, 94.1 MHz, 101.3 MHz and 107.3 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. Section 73.317(b) and the special condition of licensing associated with KMOR(FM) - Gering, NE (Facility ID: 67473) Construction Permit File Number LMS(CP)-0000100422; KNEB-FM - Scottsbluff, NE (Facility ID: 51462) Construction Permit File Number LMS(CP)-0000150145; KOZY-FM - Bridgeport, NE (Facility ID: 81766) License Modification File Number BLH-20010827AAD; and KHYY(FM) - Minatare, NE (Facility ID: 164136) Construction Permit File Number LMS(CP)-0000100427.

For a KMOR(FM).C operational power of 100.0 kW, the minimum attenuation level is -80 dBc.

For a KNEB-FM.C operational power of 75.0 kW, the minimum attenuation level is -80 dBc.

For a KOZY-FM.L operational power of 100.0 kW, the minimum attenuation level is -80 dBc.

For a KHYY(FM).C operational power of 100.0 kW, the minimum attenuation level is -80 dBc.

Frequency (in MHz)	Measurement (in dBc)	Frequency (in MHz)	Measurement (in dBc)	Frequency (in MHz)	Measurement (in dBc)	Frequency (in MHz)	Measurement (in dBc)
0.80 MHz	-103.45 dBc	92.50 MHz	-111.21 dBc	195.40 MHz	-82.12 dBc	303.90 MHz	-92.75 dBc
1.60 MHz	-106.37 dBc	93.30 MHz	KMOR(FM).C Carrier*	200.60 MHz	-82.60 dBc	307.90 MHz	-92.12 dBc
6.00 MHz	-110.19 dBc	94.10 MHz	KNEB-FM.C Carrier*	201.40 MHz	-85.89 dBc	308.70 MHz	-93.23 dBc
7.20 MHz	-111.20 dBc	94.90 MHz	-111.22 dBc	202.60 MHz	-89.18 dBc	309.90 MHz	-93.08 dBc
8.00 MHz	-110.64 dBc	95.30 MHz	-111.24 dBc	208.60 MHz	-81.32 dBc	315.90 MHz	-93.87 dBc
12.00 MHz	-112.27 dBc	101.30 MHz	KOZY-FM.L Carrier*	214.60 MHz	-84.28 dBc	321.90 MHz	-93.18 dBc
13.20 MHz	-110.49 dBc	107.30 MHz	KHYY(FM).C Carrier*	279.90 MHz	-93.13 dBc	373.20 MHz	-92.29 dBc
14.00 MHz	-110.36 dBc	108.50 MHz	-112.22 dBc	280.70 MHz	-93.23 dBc	374.80 MHz	-92.81 dBc
14.40 MHz	-114.21 dBc	109.30 MHz	-111.75 dBc	281.50 MHz	-93.51 dBc	376.40 MHz	-92.65 dBc
16.00 MHz	-114.47 dBc	113.30 MHz	-110.36 dBc	282.30 MHz	-92.74 dBc	389.20 MHz	-93.45 dBc
26.40 MHz	-113.84 dBc	120.50 MHz	-113.93 dBc	287.90 MHz	-91.64 dBc	390.80 MHz	-92.02 dBc
28.00 MHz	-114.36 dBc	121.30 MHz	-113.72 dBc	289.50 MHz	-92.69 dBc	401.20 MHz	-92.65 dBc
79.30 MHz	-112.22 dBc	186.60 MHz	-94.89 dBc	293.90 MHz	-92.46 dBc	402.80 MHz	-91.74 dBc
80.90 MHz	-111.80 dBc	187.40 MHz	-92.67 dBc	295.50 MHz	-93.17 dBc	405.20 MHz	-93.29 dBc
85.30 MHz	-111.84 dBc	188.20 MHz	-95.07 dBc	295.90 MHz	-93.05 dBc	417.20 MHz	-92.95 dBc
86.90 MHz	-111.51 dBc	194.60 MHz	-97.46 dBc	296.70 MHz	-92.88 dBc	429.20 MHz	-92.93 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 $43 + 10 \log_{10}(\text{Power, in watts})$ 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:
 - (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 twenty-three 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, Technical Consultant
September 15, 2022