

**Occupied Bandwidth and
Spurious Emissions Measurements**
To Demonstrate Compliance with
Section 73.317(b) through 73.317(d) of the
FCC Rules and Regulations

**KMXM 102.3 MHz
Helena Valley SE, MT
K235BW 94.9 MHz
Helena, MT
September 15, 2012**

Spurious Emissions Report

KMXM & K235BW

On the Evening of September 15, 2012, equipment performance measurements were made on behalf of FM broadcast translator station K235BW as per requirements set forth by the FCC file permit number: BPFT-20120524AJI. This Engineering evaluation report and RF proof of performance measurements were prepared in support of the operation of the specified transmitting system herein as to comply with 47 C.F.R. Section 73.317 (b) through 73.317 (d).

K235BW is one of two stations sharing a diplexed antenna system at the Hogback Communications site located northeast of York, MT. The outputs of the two stations (the other being KMXM(FM) Helena Valley NE, MT) are combined using a branched filter combining system Model RCCS-2M4-2.0H Starpoint Combiner System manufactured by Jampro Antennas, Inc., of Sacramento, CA.

Measurements were made while all stations broadcast programming material. All stations were operating into the combined antenna system at the full permitted power during measurements.

In the case of the KMXM transmission system, a directional coupler at the combiner output fed the measurement equipment. Measurements were made on the station's carrier frequency for reference purposes and to look at occupied bandwidth and for any spurious emissions.

The use of the IFR AN940 Serial Number 1009 spectrum analyzer within current calibration was used to make all measurements. The assigned carrier frequency level was recorded. All other harmonic intermodulation products or spurious emission levels were referenced to this initial carrier frequency reference level with a noise floor of -80dBC. The radio spectrum from 3 MHz up to the stations 10th carrier frequency harmonic was tuned to look for any unusual emissions.

The unmodulated carrier level of KMXM was +13.0 dBC and the unmodulated carrier level of K235BW was +5.6 dBC. Since the K235BW reference level was lower, it was used as the reference for all harmonic, spurious and intermodulation measurements. All measurements were conducted with the transmitters and associated equipment adjusted as used in normal program operation.

For all occupied bandwidth measurements, the spectrum analyzer was placed in the peak hold mode for at least 10 minutes per measurement before the waveforms were observed.

Both transmitters were observed to be in full compliance with section 73.317(b) of the FCC Rules with emissions appearing on frequencies removed from the carrier frequencies by between 120 kHz and 240 kHz attenuated by at least 25 dB below the unmodulated carrier level indicating the occupied bandwidth of each transmitter to be 240 kHz or less. Both transmitters were also observed to be in full compliance with section 73.317(c) of the FCC Rules with emissions appearing on frequencies removed from the carrier frequencies by between 240 kHz and 600 kHz attenuated by at least 35 dB. Results of the mask measurements follow:

#	Freq.	Sum/Diff	MEASURED dBC
1.	94.9	+120 kHz	-44.3 OK

2.	94.9	-120 kHz	-45.4	OK
3.	94.9	+240 kHz	-82.1	OK
4.	94.9	-240 kHz	-82.3	OK
1.	102.3	+120 kHz	-54.2	OK
2.	102.3	-120 kHz	-53.9	OK
3.	102.3	+240 kHz	-82.2	OK
4.	102.3	-240 kHz	-81.5	OK

Extensive measurement were also conducted to insure that emissions appearing on frequencies removed from the carrier frequencies by more than 600 kHz were attenuated by at least 80 dB as required by section 73.317(d) of the FCC Rules. To facilitate these measurements, a set of Trilithic bandpass filters model VF-40003 Serial #200514038 was used to reduce the effects of multi signal mixing in the IFR AN940 analyzer. All insertion losses have been accounted for to reflect accuracy in this report.

All harmonic and intermodulation frequencies in the range of frequencies between 3 MHz and 1000 MHz through the 3rd order that could be produced by the combined operation of KMXM and K235BW were predicted with a computer program. While special attention was given to the “product” frequencies listed by the intermodulation calculation program, measurements were conducted covering the entire range of frequencies between 3 MHz and 900 MHz. The only signals detected at levels attenuated by less than 80 dB below the unmodulated carrier levels and appearing on frequencies removed from the KMXM and K235BW carrier frequencies by more than 600 kHz were the carriers of nearby FM and Television stations. In each case where these signals were observed to be at a level greater than -76.6 dBm (80 dB below the unmodulated carrier level of K235BW) both the KMXM and K235BW transmitters were turned off while the amplitude of the signal was observed to be unchanged, indicating that the signal was not the result of the combined operation of KMXM and K235BW.

The following specific frequencies were examined for harmonic or intermodulation products and none were found to be greater than -80 dB below the unmodulated carrier level.

TABLE 1

Intermodulation Products:

SECOND ORDER HITS:

94.900000 + 94.900000 = ±189.800000
 102.300000 + 94.900000 = ±197.200000
 102.300000 + 102.300000 = ±204.600000

THIRD ORDER HITS:

94.900000 + 94.900000 + 94.900000 = ±284.700000
 102.300000 + 94.900000 + 94.900000 = ±292.100000
 102.300000 + 102.300000 + 94.900000 = ±299.500000
 102.300000 + 102.300000 + 102.300000 = ±306.900000

FOURTH ORDER HITS:

94.900000 + 94.900000 + 94.900000 + 94.900000 = ±379.600000
102.300000 + 94.900000 + 94.900000 + 94.900000 = ±387.000000
102.300000 + 102.300000 + 94.900000 + 94.900000 = ±394.400000
102.300000 + 102.300000 + 102.300000 + 94.900000 = ±401.800000
102.300000 + 102.300000 + 102.300000 + 102.300000 = ±409.200000

FIFTH ORDER HITS:

94.900000 + 94.900000 + 94.900000 + 94.900000 + 94.900000 = ±474.500000
102.300000 + 94.900000 + 94.900000 + 94.900000 + 94.900000 = ±481.900000
102.300000 + 102.300000 + 94.900000 + 94.900000 + 94.900000 = ±489.300000
102.300000 + 102.300000 + 102.300000 + 94.900000 + 94.900000 = ±496.700000
102.300000 + 102.300000 + 102.300000 + 102.300000 + 94.900000 = ±504.100000
102.300000 + 102.300000 + 102.300000 + 102.300000 + 102.300000 = ±511.500000

The results of these measurements confirm that the combined operations of KMXM and K235BW into a shared antenna are in full compliance with section 73.317(b) through 73.317(d) of the FCC Rules and Regulations.



Kevin Terry
Director of Engineering
The Montana Radio Company, LLC