

Equipment Performance Measurements

Station: K251AK(CP) Thomasville CO 98.3 MHz

Date: 5/7/15

Equipment performance measurements were conducted to confirm compliance with section 73.317 of the FCC Rules, copy attached. Measurements were taken using:

- Coaxial Dynamics model 87036 directional coupler (60 dB)
- Coaxial Dynamics model 6019 attenuator (20 dB)
- Bird model 10A-MFN-10 attenuator (10 dB)
- Bird model 2A-MFN-10 attenuator (10 dB)
- Microwave Filter Company model 6367-2 Tunable Notch Filter (two section)
- EMR FM-6354 dual cavity bandpass filter
- RG-142 double shielded cables
- A non-directional coupler in the station's transmission line
- A directional coupler in the station's transmission line
- A broadband receive antenna directed at the transmit antenna of the station
- Tektronix 2712 spectrum analyzer, S/N B044222
Traceable calibration 4/17/15
- _____

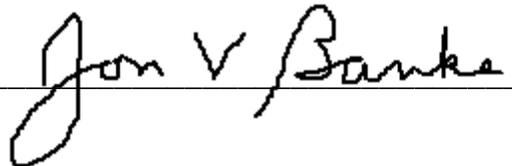
and,

- The station was in compliance with section 73.317
- The station was not in compliance with section 73.317.

Comments:

This is a multi-user site, with six FM translators licensed. The station's construction permit has a special operation condition requiring spurious and harmonic measurements with all stations operating. Special attention was given to the possibility of intermodulation among these stations and other nearby transmitters, as described in the test procedure. The station's occupied bandwidth met the standard, and the largest spurious or harmonic product seen was -62 dbc, which met the requirement of -56 dB.

Signed



Test Procedure:

The authorized ERP for K251AK(CP) is 20 watts, so the maximum level of spurious products more than 600 kHz from the carrier is 56 dB. $(43+10*\log_{10}[ERP])$

K251AK(CP) operates into its own antenna at a multi-user site, with several other FM translators. In addition to normal occupied bandwidth and harmonic measurements, special attention was given to possible third order intermod products, especially on the frequencies predicted as combinations of 98.3 and 97.1 (closest frequency used at the site). At this time, K251AK(CP) is operating into its own antenna; applicant intends to combine some other translators at this site into this antenna, but has not done so yet. As the other stations join K251AK(CP) on this antenna, additional measurements will be made to verify compliance with section 73.317.

The test procedure was simple. A broadband antenna, connected directly to a spectrum analyzer was set up 1.03 miles SE of the translator site, at a parking area for a 10th Mountain Hut. This is in a main lobe of the translator's directional antenna with direct line of sight. Attenuators and notch filters were not needed to view the spectrum to a level -75 dB below carrier; that was sufficient since the required attenuation was just 56 dB. The spectrum analyzer had sufficient dynamic range without notching the carrier.

The spectrum was inspected for occupied bandwidth, harmonics, spurious, and intermodulation products. Since this was a far-field measurement, many weak signals were seen from area FM stations. A tuner was used to determine whether each signal seen was legitimate, or an intermodulation product. One intermodulation product was seen, on 99.5 MHz, at a level 62 dB below the 98.3 carrier. That meets the requirements.

No harmonics were visible at a level -75dBc, and occupied bandwidth was within limits.

All translators at the site were operating at licensed power into their respective antennas during these measurements.

§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 $43 + 10 \text{ Log}_{10}(\text{Power, in watts})$ 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.)

73.44 AM TRANSMISSION SYSTEM EMISSION LIMITATIONS.

(a) The emissions of stations in the AM service shall be attenuated in accordance with the requirements specified in paragraph (b) of this section. Emissions shall be measured using a properly operated and suitable swept-frequency RF spectrum analyzer using a peak hold duration of 10 minutes, no video filtering, and a 300 Hz resolution bandwidth, except that a wider resolution bandwidth may be employed above 11.5 kHz to detect transient emissions. Alternatively, other specialized receivers or monitors with appropriate characteristics may be used to determine compliance with the provisions of this section, provided that any disputes over measurement accuracy are resolved in favor of measurements obtained by using a calibrated spectrum analyzer adjusted as set forth above. (Revised 89-118, 6/30/90)

(b) Emissions 10.2 kHz to 20 kHz removed from the carrier must be attenuated at least 25 dB below the unmodulated carrier level, emissions 20 kHz to 30 kHz removed from the carrier must be attenuated at least 35 dB below the unmodulated carrier level, emissions 30 kHz to 60 kHz removed from the carrier must be attenuated at least $[5 + 1 \text{ dB/kHz}]$ below the unmodulated carrier level, and emissions between 60 kHz and 75 kHz of the carrier frequency must be attenuated at least 65 dB below the unmodulated carrier level. Emissions removed by more than 75 kHz must be attenuated at least $43 + 10 \text{ Log (Power in watts)}$ or 80 dB below the unmodulated carrier level, whichever is the lesser attenuation, except for transmitters having power less than 158 watts, where the attenuation must be at least 65 dB below carrier level. (Revised 89-118, 6/30/90)

(c) Should harmful interference be caused to the reception of other broadcast or non-broadcast stations by out of band emissions, the licensee may be directed to achieve a greater degree of attenuation than specified in paragraphs (a) and (b) of this section. (Added 82-26, 2/19/82)

(d) Measurements to determine compliance with this section for transmitter type acceptance are to be made using signals sampled at the output terminals of the transmitter when operating into an artificial antenna of substantially zero reactance. Measurements made of the emissions of an operating station are to be made at ground level approximately 1 kilometer from the center of the antenna system. When a directional antenna is used, the carrier frequency reference field strength to be used in order of preference shall be: (Added 82-26, 2/19/82)

(1) The measured non-directional field strength. (Added 82-26, 2/19/82)

(2) The RMS field strength determined from the measured directional radiation pattern. (Added 82-26, 2/19/82)

(3) The calculated expected field strength that would be radiated by a non-directional antenna at the station authorized power. (Added 82-26, 2/19/82)