December 11, 2016

To: Turquoise Broadcasting Company, LLC
Attention: Gary Rose, Managing Member
P. O. Box 8125
Tumacacori, AZ 85640-8125

From: David Becker BSEE, MSEE
Member of Society of Broadcast Engineers (SBE)
FCC General Radio Telephone License PG 23-1349
(FCC First Class Radio Telephone License issued in 1965)

Re: Installation of FM Translator Station K265EX combined with existing FM Translator stations K249BY and K283AB, Soldotna, Alaska.

Compliance with RF Transmission System Requirements, Title 47 CFR Sections 73.317(b), (c) and (d)

Dear Mr. Rose,

I recently returned from Soldotna, Alaska on 12/11/16 after installing FM Translator station K265EX on behalf of TBC and making compliance measurements using a Spectrum Analyzer.

Because TBC's single translator K265EX on 100.9 MHz was added to a star cavity bandpass filter combiner system that shares a common antenna, it was necessary to verify compliance with the above referenced FCC rules regarding (b) any emission appearing from a frequency removed from the carrier by between 120 kHz and 240 kHz inclusive that must be attenuated at least 25 dB below the unmodulated carrier; (c) Any emission appearing on a frequency removed from the carrier by more than 240 kHz and up to and including 600 kHz that must be attenuated at least 35 dB below the level of the unmodulated carrier and (d) Any emission appearing on a frequency removed from the carrier by more than 600 kHz that must be attenuated at least 43 + 10 log10 Power (in watts) dB below the level of the un-modulated carrier.

The equipment setup in Soldotna consisted of two existing TEPCO J-317 FM translators plus two PTEK power amplifiers. TBC equipment to be added consisted of one TEPCO J-317 FM translator and one Superior Broadcast Company power amplifier.

Maximum permissible levels for any spurious emission for each translator must be the following (allowing for 2 dB maximum insertion loss for each bandpass cavity filter of the star power combiner):

K249BY 97.7 MHz = 62.3 dB below the un-modulated carrier

K265EX 100.9 MHz = 56.3 dB " " " "

K283AB 104.5 MHz = 65.7 dB " " " "

TEST EQUIPMENT used:

HP 9443A Tracking Generator /Frequency Counter
Tektronix Model 492/6 Spectrum Analyzer 1 kHz to 1.8 GHz
Bird Variable RF Signal Sampler Model 4275-020 20 – 1000 mHz.
Grundig S350 High Quality Digital FM Receiver

MEASUREMENTS:

Measurements were made with Tektronix Model 492/6 Spectrum Analyzer connected to the Bird Signal Sampler inserted between the transmit antenna coaxial connection and the common output feed point of the star-type, three channel cavity combiner with all three translators on the air.

With regard to Section 73.317 (b) and (c), all three signals were examined extensively with the Tektronix Spectrum Analyzer for compliance of all emissions at least 25 dB down from the unmodulated carrier reference between 120 and 240 kHz (plus / minus center frequency) and at least 35 dB down from the unmodulated carrier reference between 240 and 600 kHz.

All three carriers were found to be in compliance and looked very “clean”, both with and without modulation.

The following frequencies are present at the combiner antenna common point:

F(a) = 97.7 MHz (existing)
F(b) = 100.9 MHz (new)
F(c) = 104.5 MHz (existing)

With regard to spurious emissions per Section 73.317(d) the following frequencies are potential offenders for 'Third Order" generated IM products:

F (a) + F(b) - F(c) = 94.1 MHz
F (a) + F(c) - F(b) = 101.3 MHz
F (b) + F(c) - F(a) = 107.7 MHz

2F(a) - F(b) = 94.5 MHz
2F(a) - F(c) = 90.9 MHz
2F(b) - F(a) = 104.1 MHz
2F(b) - F(c) = 97.3 MHz
2F(c) - F(a) = 111.3 MHz
2F(c) - F(b) = 108.1 MHz

The Tektronix Spectrum Analyzer was setup for an input level 10 dBm / 40 dB attenuation and carrier peak levels displayed at the top of the 80 dB dynamic range oscilloscope display. (The Bird RF non-directional signal sampler was adjusted to place the carrier peaks at the top of the display and variable coupling locked down). Sweep bandwidth was set to 100 kHz per division. (This gives a horizontal display of plus / minus 500 kHz.

The entire FM band was examined from 88 to 108, plus the two out of band frequencies of 108.1 and 111.3 MHz. All emissions were found to be below the required 56.3 to 65.7 dB minimum relative to the 3-respective carrier peak levels. Residual baseline noise was approximately 70 dB below the carrier peaks.

All three carriers met the required minimum spurious level of 56.3 dB to 65.7 dB down more than 600 kHz away from the respective carrier center frequencies.

Attached is Exhibit 1 of the spectrum display of 88 to 108 MHz (2 MHz / division) with the Tektronix Spectrum Analyzer set to 0 dBm (10 dB/div.). Two "spikes" in the display above the 65.7 dB minimum limit were determined to be coming from two local FM stations transmitting from nearby locations to the translator antenna site on the Kenai Spur Highway:

1) KKIS-FM on 96.5 MHz 10 kW (H) & (V)

2) KDLL on 91.1 MHz 4.9 KW (H) & (V)

These two relatively high power FM stations (compared to the relatively low output power of the 3 FM translator stations) are the source of the indicated spikes on the spectrum display. Because these two stations are located near the translator's transmit site, the translator's antenna was also acting as a good "receive" antenna attached to the spectrum analyzer.

There were no indicated spurious emissions from any of the expected Third Order Inter-Modulation products as calculated from the list of frequencies shown above.

Based on the foregoing I believe that the addition of your FM translator station K265EX to the existing "star" antenna combiner system for K249BY and K283AB operating in Soldotna, Alaska to be in full FCC compliance with the requirements of Title 47 CFR Section 73.317(b), (c) and (d) of FCC rules.

Sworn to be true to the best of my knowledge under penalty of perjury:

David F. Becker Consulting Engineer
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EXHIBIT 1 – SPECTRUM ANALYZER

Exhibit of the spectrum display of 88 to 108 MHz (2 MHz / division) with the Tektronix Spectrum Analyzer set to 0 dBm (10 dB/div.).