



*From the desk of Lonnie England C.E.*

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March 15, 2018

RE K254CJ Transmitter

On Thursday March 15, 2018 I, Lonnie England CPBE, went to Chelan Butte, Chelan County, Washington to satisfy the THREE special conditions on FCC Construction Permit BNPFT-20150521ABQ, Fac ID 155805, for FM translator station K254CJ by request of John Habberman of Divine Mercy Boascasting.

FCC Type Accepted Broadcast Equipment per CFR 47 Parts 73.1660 and 74.1250

Transmitter= BW Broadcast TX-50 V2 FCC ID: TUO TX25-50

Antenna Specified in CP= DUAL Shively Labs 6025 mounted on NORTH face of TRI-Mast R-45 tower structure thus makes antenna very directional @ LOBE 345° Center of Radiation FCC ID: 121466 (GAIN OF EACH ANT V/H 4dB (7dB minus -3dB for 50/50 power divider at ant's) System GAIN= +4dB

Extra Protective Equipment installed per NCW Communications Engineering Group for use of this communications facility:

EMR-FM4350/L 98.7 Mhz (.15dB insertion Loss)

Telewave T-1030 Ferrite Isolator 98.7Mhz (-.65dB insertion Loss)

Transmission line is 100' of Andrew LDF-4-50A ½" Heliax ( - .653dB insertion Loss)

Transmission Line Connectors: 2-Commscope L4TNM-PSA ( - .10dB insertion Loss)

Transmitter settings: 75uS pre-emphasis, DEV Limiter=72kHz,  
Transmitter RF Mute on silence = ON Transmitter=MONO (NO PILOT's)

Broadcast antenna is NOT shared with any other transmitter.

**Test Equipment used:**

**Tektronics 492 Spectrum Analyzer (calibrated 2/16/2018)**

**Inovonics Digital FM Modulation Analyzer 531 (calibrated 2/05/2018)**

**CMC 440015 Directional Coupler -30dB last verified (2/16/2018)**

**Bird 43 Watt Meter w/ 25watt slug (to verify TPO at transmitter output and TX PWR meter)**

The TEK 492 Spectrum Analyzer was connected to the RF sample of the transmitter BEFORE EMR-FM4350/L and Telewave T-1030 Ferrite Isolator and antenna. The communications site has MANY FM and TV transmitters. By connecting the analyzer this way it verifies that NONE of the other licensees RF is getting into this transmitter to mix and thus NO RF intermodulation is present >100dB isolation. It also provides a RAW RF signal from the transmitter to see if the transmitter harmonics are meeting specifications.

After I recorded/documented the required exhibits, I inserted a CMC 440015 s/n C424 30dB directional coupler between isolator and antenna transmission line to verify if any harmonics from transmitter were getting OUT and feeding the antenna to verify that the EMR-FM4350/L and Telewave T-1030 Ferrite Isolator are doing their job. Each recorded harmonic EXHIBIT contained in this report was UN-READABLE thus beyond the 120dB resolution of the analyzer. There are NO harmonics or out of band RF reaching the broadcast antenna. There are NO IN-BAND harmonics from this transmitter.

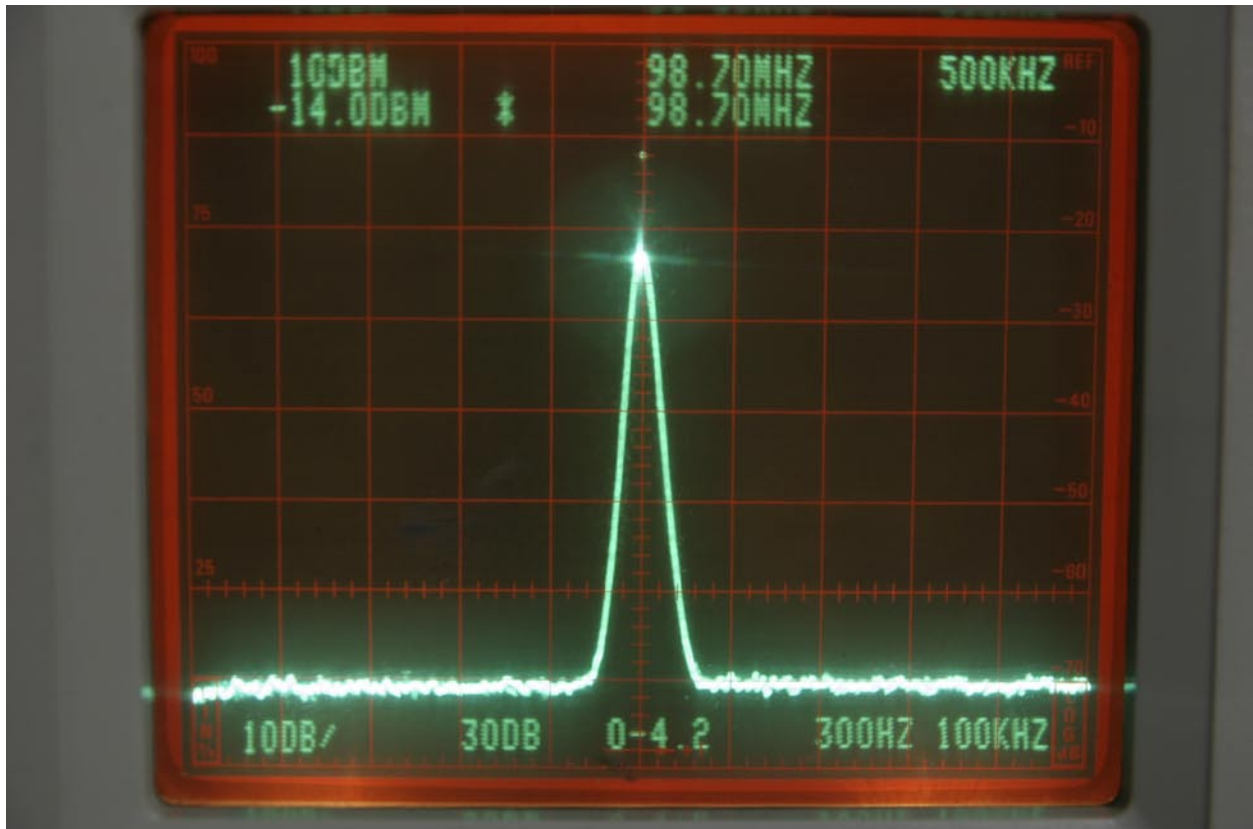
**TPO / ERP calculations:**

**Total Losses: -1.553 dBd PLUS Ant gain AFTER 50/50 POWER DIVIDER +4dB**

**TOTAL SYSTEM GAIN = +2.4dB**

**TPO=7.4 watts – 1.553 dB losses PLUS 4dB ant gain which equates 12.860 watts ERP per polarity V/H thus is NOT exceeding the FCC CP of ERP of 13 watts V or 13 watts H thus is at 98.923% power and is within the FCC rules of 90% to 110% ERP operating requirements.**

Exhibit #:	Description:	Level:	Result:
Exhibit-01	Primary Signal 98.7FM ref level:	-14dBm	REF@+10dBm scale



13 watts ERP

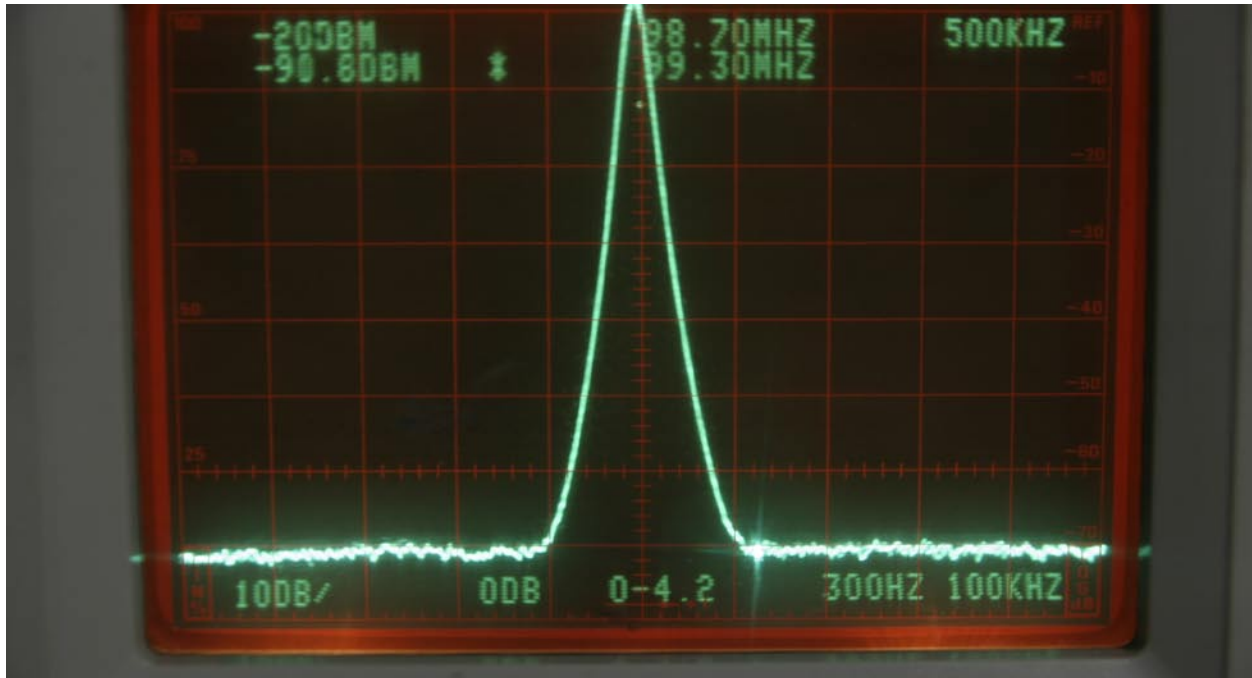
$43 + 10\log(13) = 54.1394335231\text{dB}$

(maximum emission must be less than -13dBm)

**47CFR 73.317**

(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.

$$98.7 + .600 = 99.3 \text{ is } -90.30\text{dBm} \quad \text{REF} = -14\text{dBm} \quad = -76.30\text{dBm down at 600kHz}$$



$$13 \text{ watts ERP (+11.1dBW), MINUS } -76.30\text{dBm} = -65.2 \text{ dBW} = \underline{-35.2\text{dBm}}$$

$$43 + 10 \log(13) = \underline{54.1394335231\text{dB}} \quad (\text{maximum emission must be less than } -13\text{dBm})$$

Does K254CJ @600kHz (99.3FM) PASS 47CFR 73.317(d)

YES by 22.2dB

Exhibit #:	Description:	Level:	Result: (REF-Harmonic)
Exhibit-02	2 <sup>nd</sup> Harmonic at 197.40Mhz	-81.2dBm	-67.20 dBm down (-10dBm scale)

13 watts ERP (+11.1dBW), MINUS -67.20dBm = -56.1 dBW = -26.1dBm

43+10log(13)= 54.1394335231dB (maximum emission must be less than -13dBm)

#### 47CFR 73.317

(d) Any emission appearing on a frequency removed from the carrier by more than 600 kHz must be attenuated at least 43 10 Log<sub>10</sub>(Power, in watts) dB below the level of the unmodulated carrier, or 80 dB, whichever is the lesser attenuation.

Does K254CJ second harmonic pass 47CFR 73.317(d) YES by 13.1dB

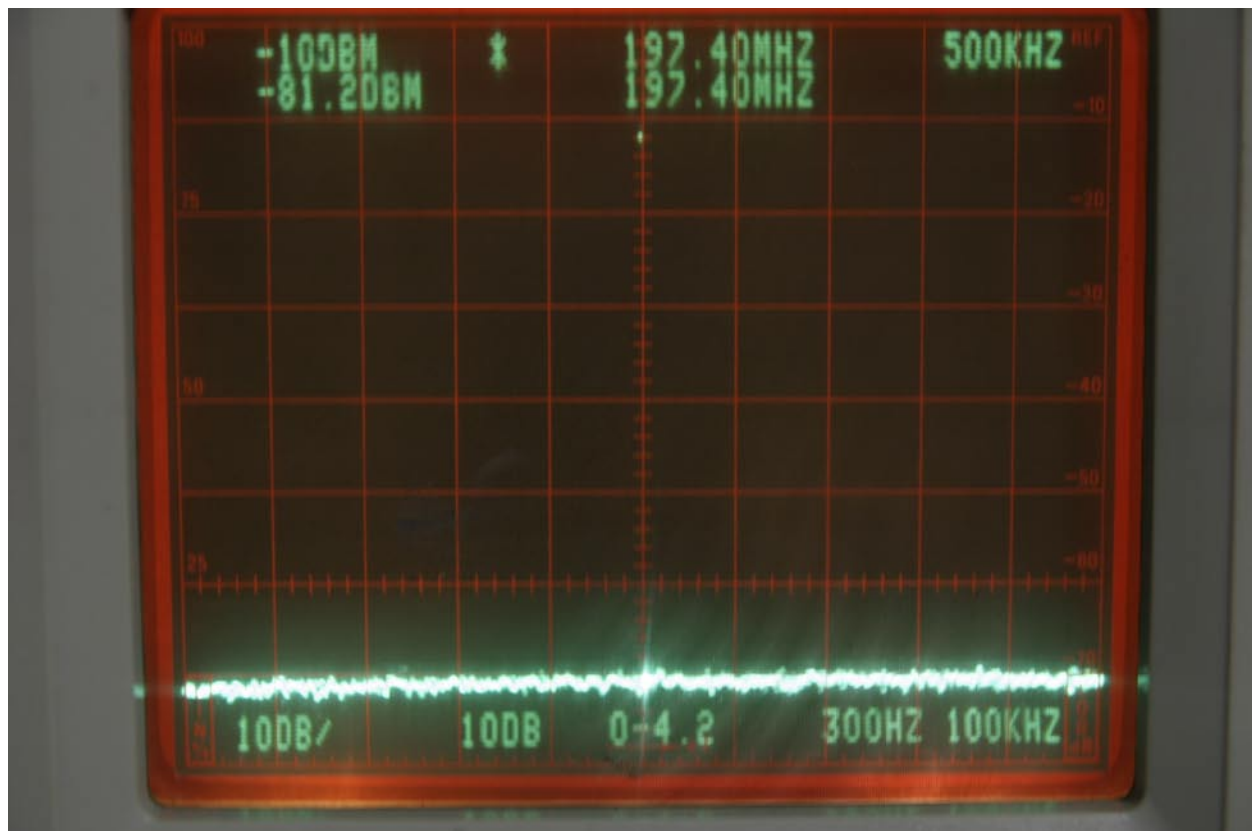


Exhibit #:	Description:	Level:	Result: (REF-Harmonic)
Exhibit-03	3rd Harmonic at 296.10Mhz	-80.80dBm	-66.80 dB down(-10dBm scale)

13 watts ERP (+11.1dBW), MINUS -66.80dBm = -55.7 dBW = -25.7dBm

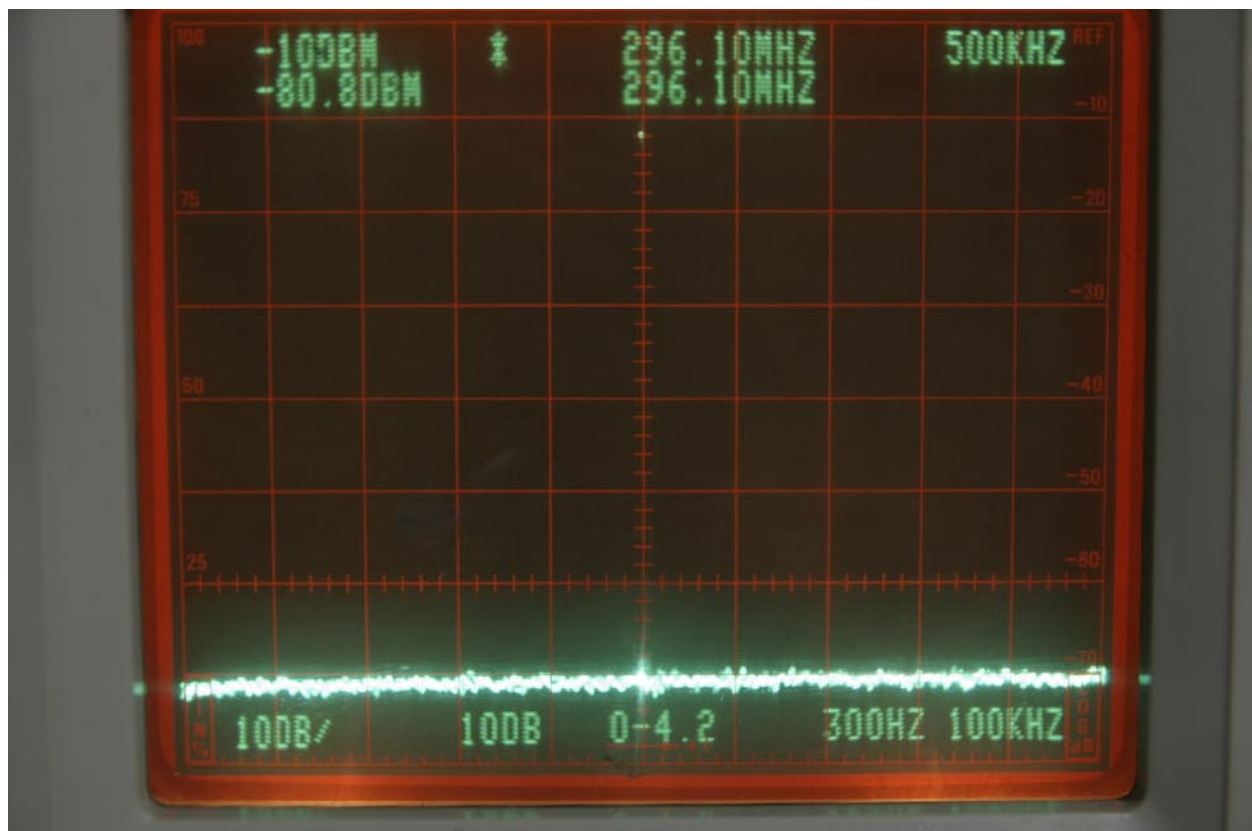
$43 + 10 \log(13) = \underline{54.1394335231 \text{ dB}}$  (maximum emission must be less than -13dBm)

#### 47CFR 73.317

(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.

Does K254CJ third harmonic pass 47CFR 73.317(d) YES by 12.7dB

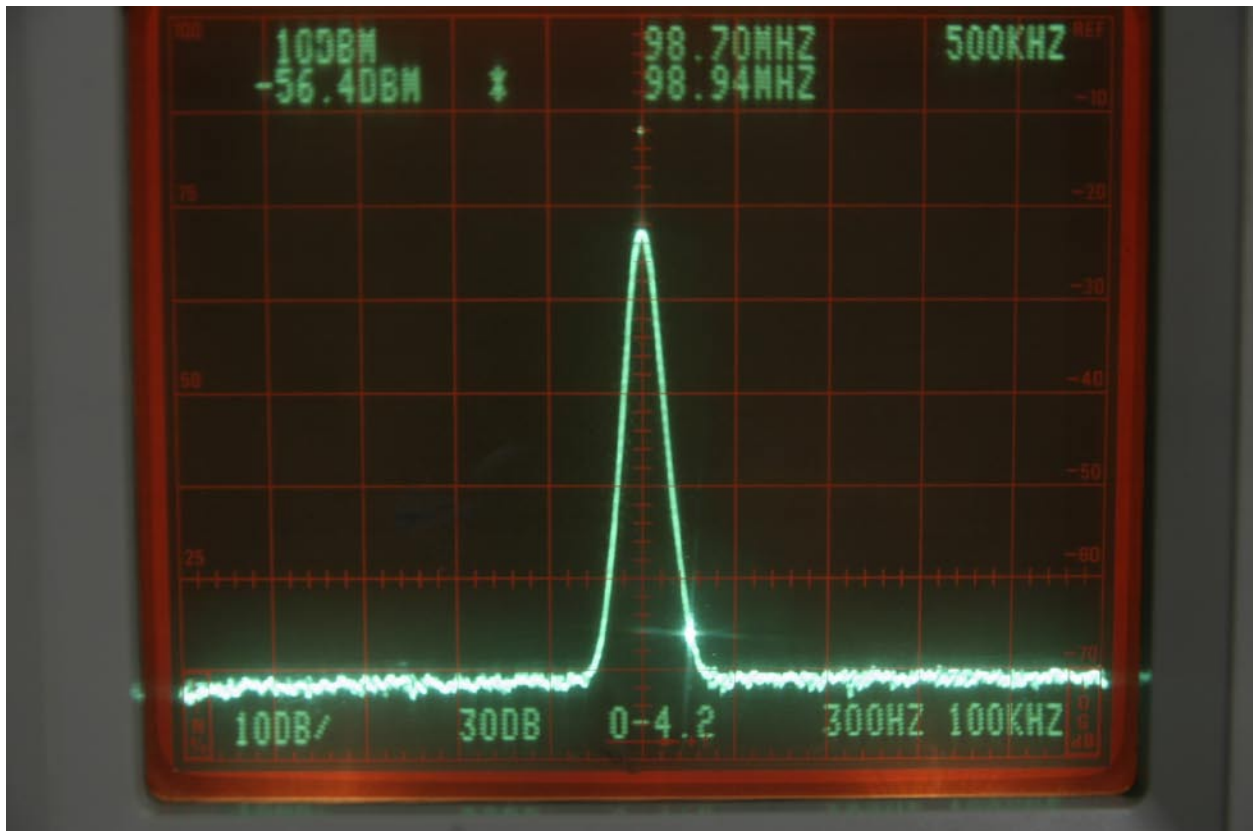
Harmonics at the 4<sup>th</sup> and greater were unreadable thru 1000Mhz.



**47CFR 73.317**

(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.

$98.700 + .240 = 98.94$  level at 98.94 = -56.4dBm REF level = -14dBm **diff = 42.4dB**

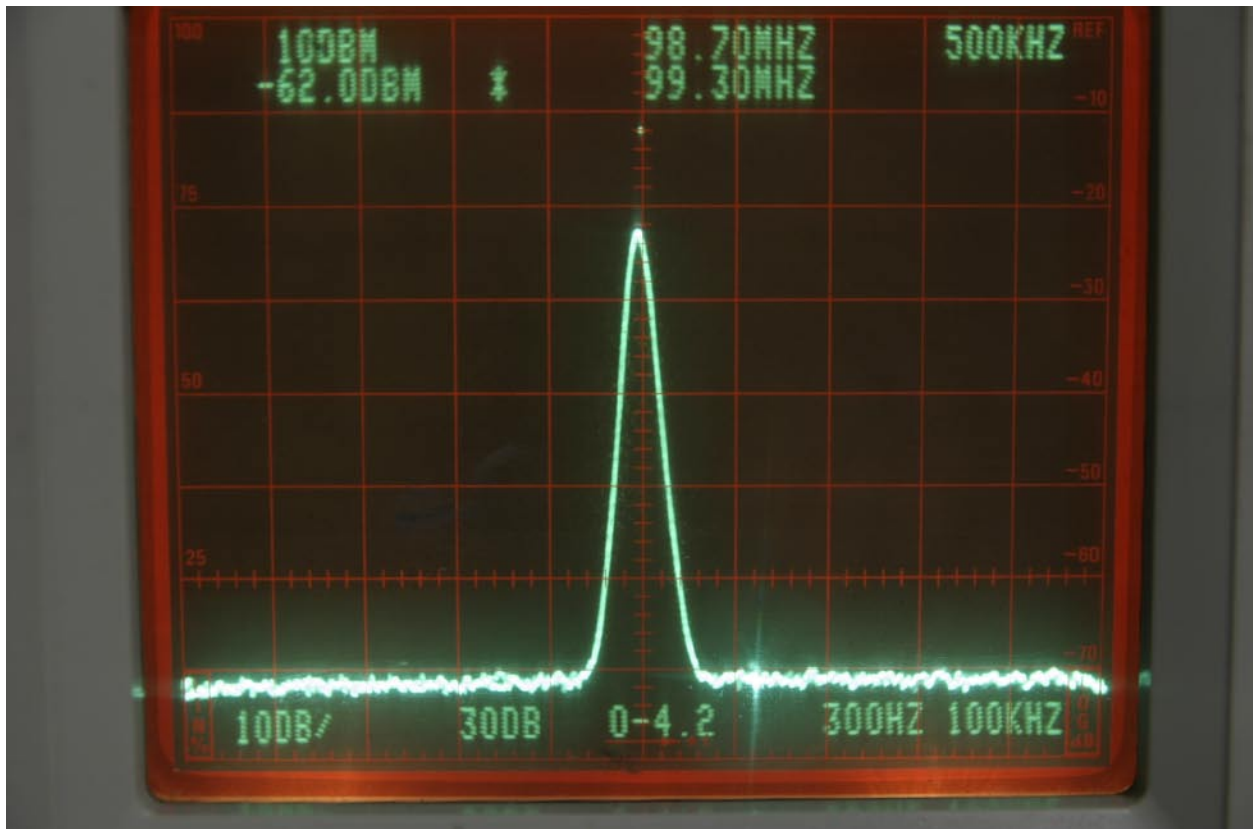


Does K254CJ translator PASS 47CFR 73.317(b)

**YES by 17.4dB**

(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.

$98.700 + .600 = 99.30$  level at 99.30 = -62.0dBm REF level = -14dBm **diff = 48.0dB**



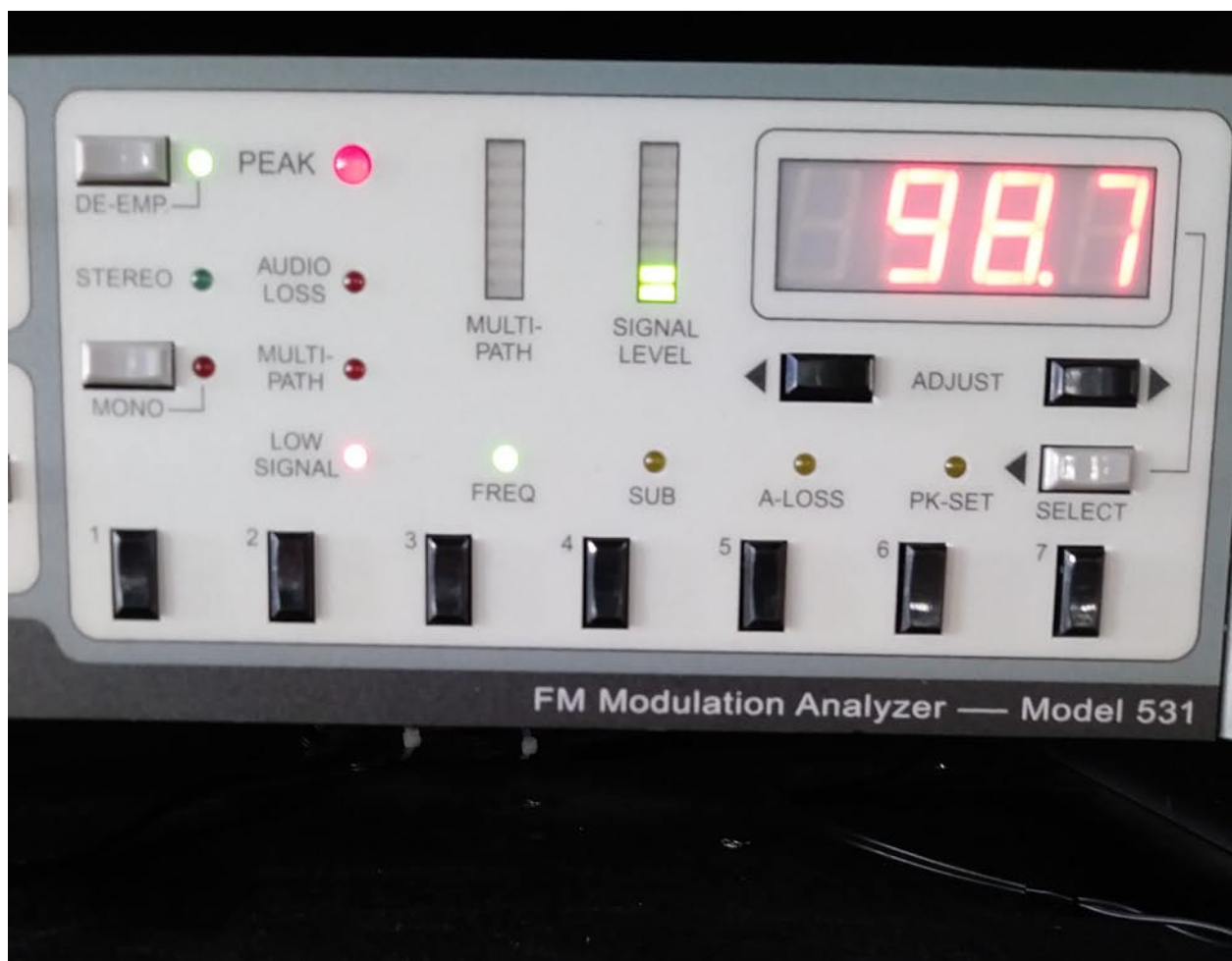
Does K254CJ translator PASS 47CFR 73.317(c)

**YES by 13.0dB**

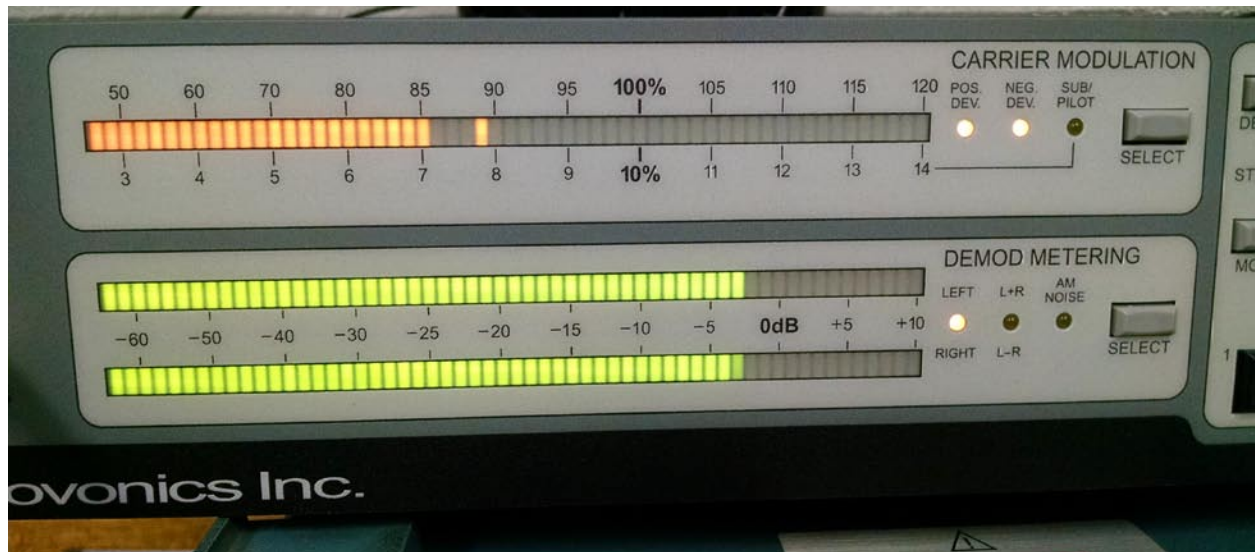


The BW Broadcast Transmitter has a built-in DEV and Limiter function. The audio from the decoder (a spanish sub-channel of the primary KDMB 88.7) is fed into the MONO/LEFT channel of the transmitter via audio cable to XLR connector.

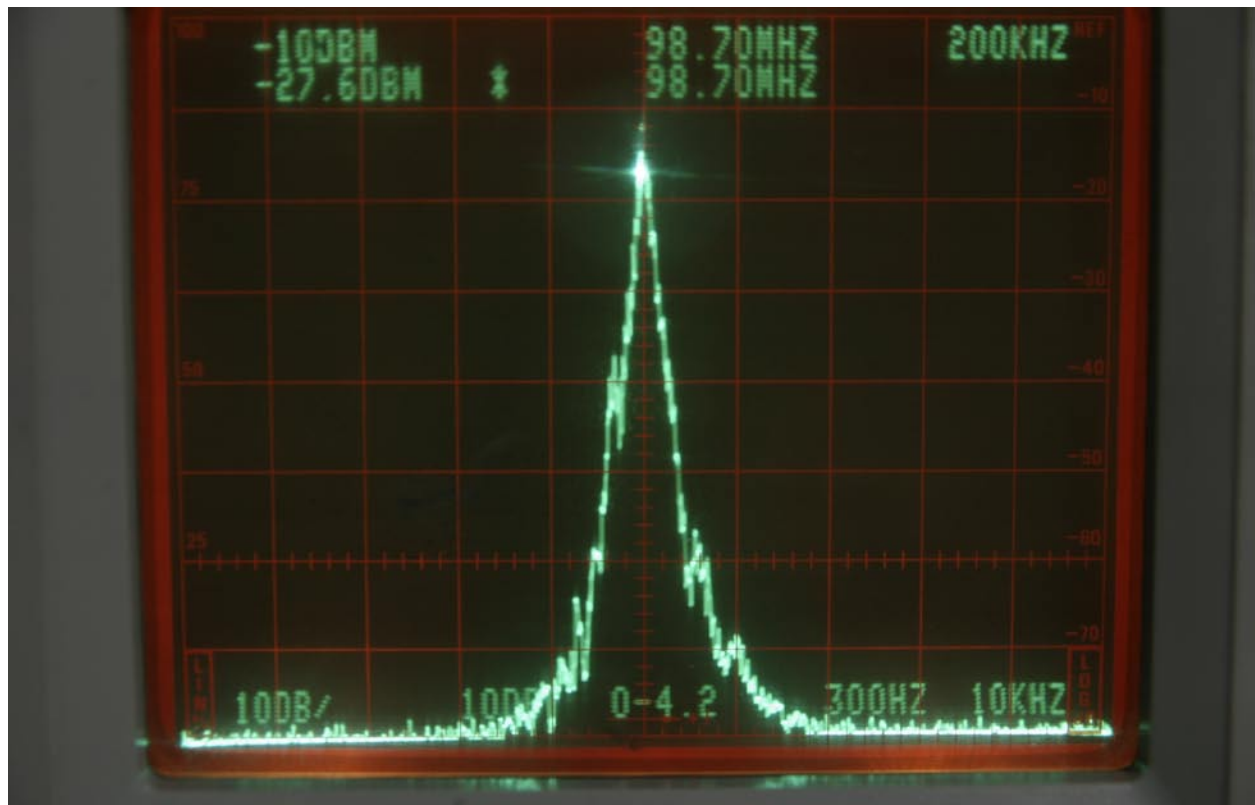
This picture shows I have signal level and NO multipath



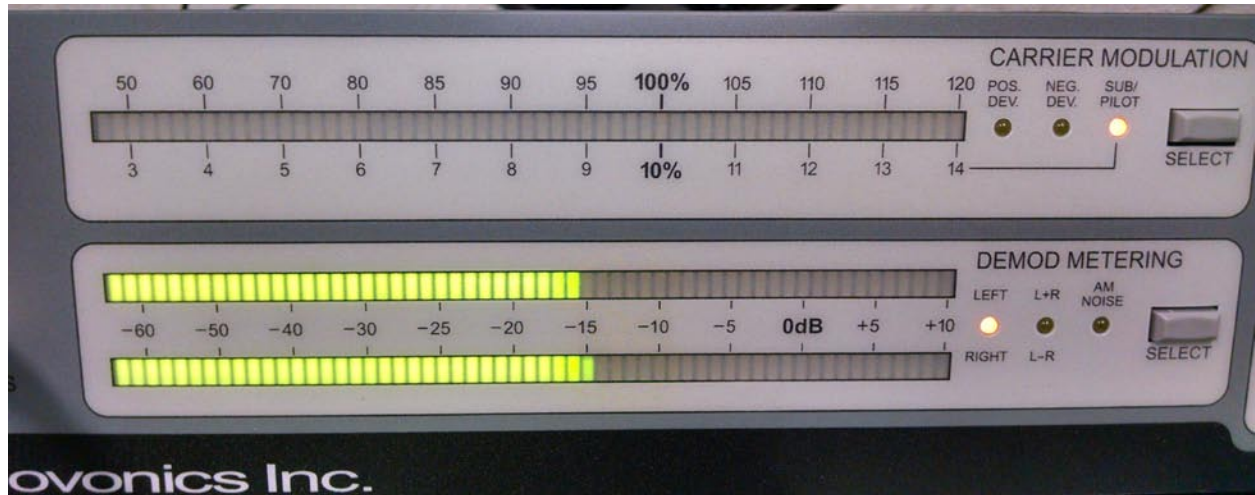
This picture shows DEV/Modulation is peaking at 89% which is the same as the primary station being received at the time of reading.



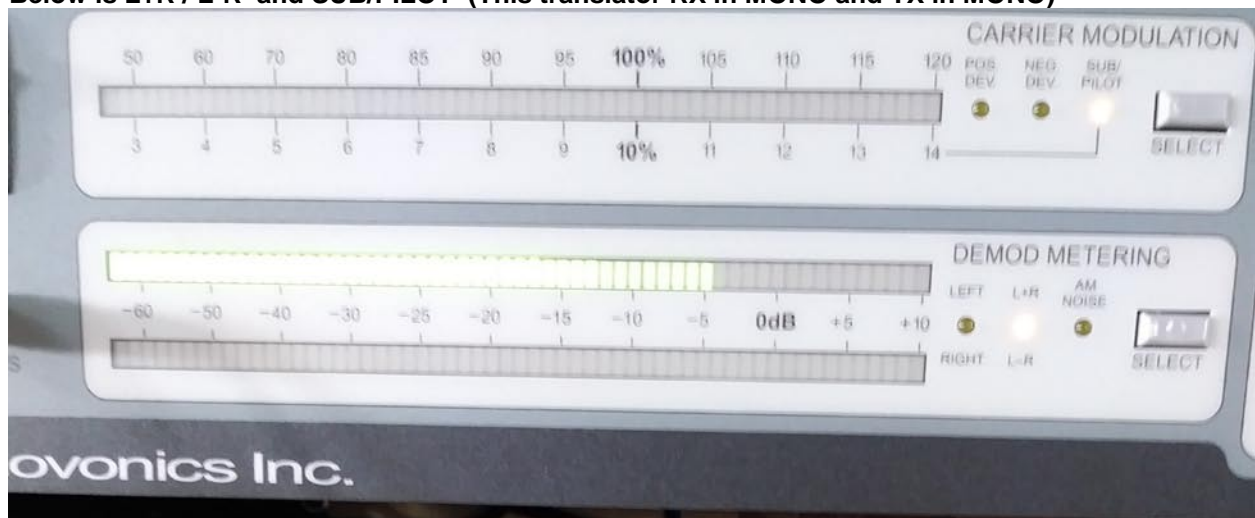
Below is RF carrier WITH modulation.



This picture shows there are NO pilot or sub-channels being broadcast by translator.



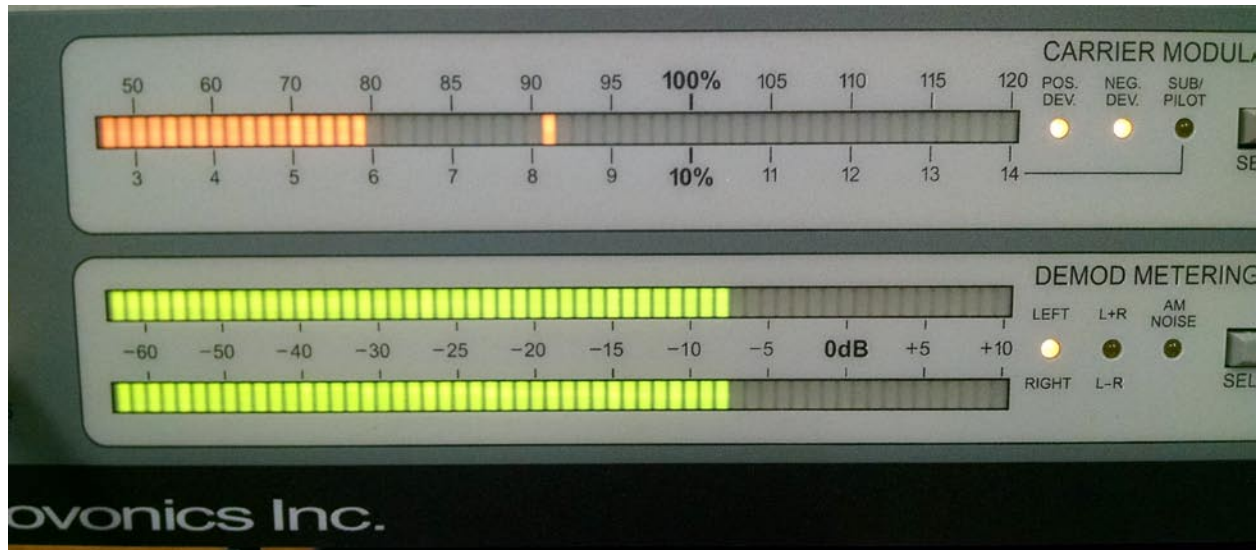
Below is L+R / L-R and SUB/PILOT (This translator RX in MONO and TX in MONO)



Please note that the BW Broadcast TX-50 V2 transmitter has a builtin setable limiter feature. It is currently set to a MAXIMUM of 72kHz. I tested this by adjusting the gain of the audio level on back of transmitter to EXCEED incoming level to see if this feature worked, it did and held

at 72Khz DEV. I turned OFF the limiter and DEV exceeded 120% for less than 10 seconds for the test. I then turned limiter back on recalibrated the audio levels.

This picture is when the limit of 72Khz DEV was reached and limited with a high audio level. Content was just voice and peaked at 92% modulation thus limiter with 120% modulation into transmitter limited to a maximum of 92% modulation.



Does K254CJ DEV/Modulation pass 47CFR 73.317(b)(c) with modulation?

YES by 8db as shown above with modulation and by EXHIBIT-01 without modulation

100% on carrier modulation on Inovonics = 75Khz DEV

Receiver and transmitter audio levels are EXACTLY calibrated with each other so if primary station EXCEEDS 75Khz modulation for what ever reason, this translator will NOT exceed 72Khz DEV.

The above exhibits satisfies special conditions #3 of the construction permit.

This report is to satisfy special conditions #2 of the construction permit as an attachment to FCC FORM-350.

Mike Peterson of KSPS-Spokane and myself, Lonnie England are the site managers of the Chelan Butte Communications Facility and do turn down RF levels at the site to a safe RF level to prevent RF exposure and adhere to RF Exposure limits, thus satisfies special conditions #1 of the constructions permit. It is also required by the other users at the site to reduce power levels. We also require a MINIMUM of TWO persons at the site at any given time and for any reason of the visit.

This party to the application is in compliance with Section 5301 of the *Anti-Drug Abuse Act of 1988*, 21 U.S.C. Section 862, the federal law which provides federal and state court judges the discretion to deny federal benefits to individuals convicted of offenses consisting of the distribution of controlled substances. For a definition of "party" for these purposes, see [47 C.F.R. Section 1.2002\(b\)](#). See also *Amendment of Part 1 of the Commission's Rules to Implement Section 5301 of the Anti-Drug Abuse Act of 1988*, 6 FCC Rcd 7551, 57 Fed. Reg. 00186 (1991).

I, Lonnie England, certify that, I am not subject to a denial of federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862, or, in the case of a non-individual applicant (e.g., corporation, partnership or other unincorporated association), no party to the application is subject to a denial of federal benefits that includes FCC benefits pursuant to that section. For the definition of a party for these purposes, see 47 C.F.R. Section 1.2002(b).

I certify that the statements made in this report / proof of performance are true, complete, and correct to the best of my knowledge and belief, and are made in good faith.

Respectfully  
Lonnie England-CPBE-16041  
Radio & Television  
Director of Engineering  
Saddlerock Professional Services  
WA#604174733  
CW#170349

K254CJ / 155805 Report / Proof of Performance completed March 23, 2018