K236CX – Casper, WY

FacID# 202345 – 95.1MHz

Form 350 – Exhibit #1
Legal Certifications

Townsquare License, LLC is the permittee of the translator facility referenced herein and licensee of associated parent AM station, KTWO Casper, WY (Facility ID 11924). By means of this exhibit, Townsquare License, LLC affirms compliance with the Special Operating Conditions of the underlying construction permit as follows:

Licensee agrees to coordinate with other users of the site to reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from radio frequency electromagnetic fields in excess of FCC guidelines, in compliance with Special Operating Condition #1.

Construction of K236CX as authorized by the underlying construction permit, file number BNPFT-20180430ABP has been completed. K236CX is prepared to commence program tests with its new facility immediately upon filing of this instant application in accordance with Special Operating Condition #2 of the aforementioned construction permit.

With respect to Special Operating Condition #3, a comprehensive survey to confirm compliance with the spurious emissions requirements of 47 C.F.R. Sections 73.317(b) through 73.317(d) was performed and is included with this exhibit.

In accordance with Special Operating Condition #4, pre and post-construction measurements of the KKTL antenna impedance were performed and confirmed a less-than 2 percent change from licensed value. As such, no Form 302-AM has been prepared nor will be filed on behalf of KKTL.

Licensee hereby acknowledges and certifies compliance with Special Operating Condition #5 pursuant to the Revitalization of the AM Radio Service, Notice of Proposed Rule Making, 28 FCC Rcd 15221, 15227, para. 14 (2013), and First Report and Order, 30 FCC Rcd 12145, 12154, para. 17 and n. 43 (2015).

Report of Inter-Modulation Product Measurements
for the
Operation of the Combined FM Systems
K270CT 101.9 MHz
K236CX 95.1 MHz

LOCATED AT
KKTL(AM) SITE
MILLS, WYOMING

MEASUREMENTS COLLECTED
NOVEMBER 2021

Measurements collected and prepared by
Matthew Brown
Chief Engineer
Townsquare Media

Table of Contents

Introduction

This report of findings provides evidence to show that the operation of a two-station combined facility located near Mills, Wyoming is in compliance with the FCC Rule and Regulations as required by the Code of Federal Regulations (CFR) Title 47 Section 73.317, and specifically related to potential intermodulation products that may occur and must typically be below the limit specified by 73.317 paragraph (d).

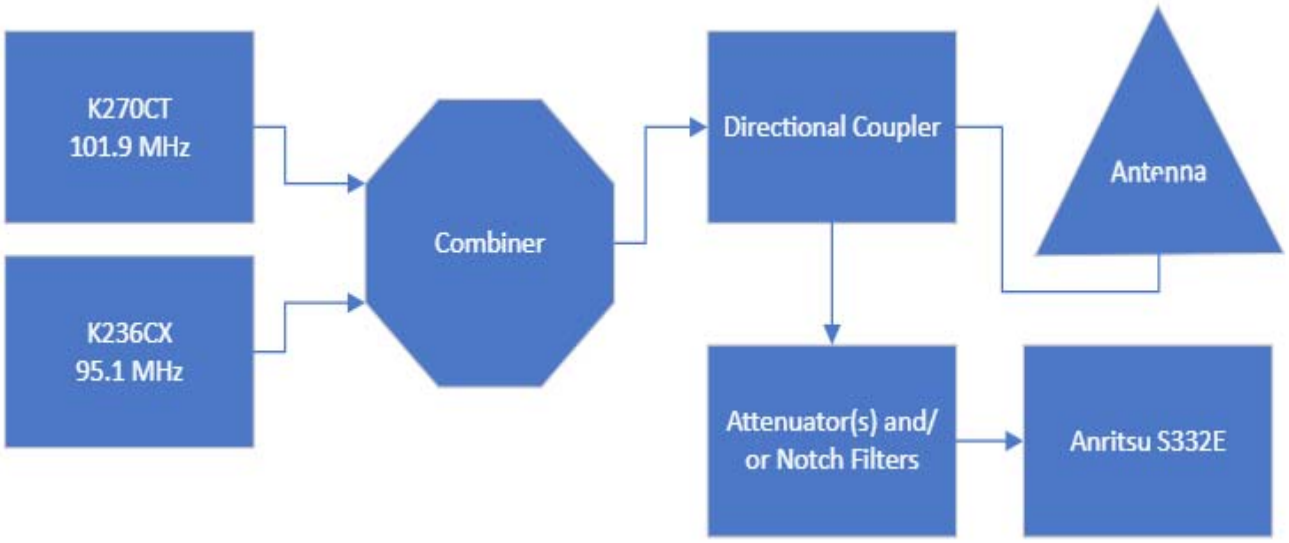
In brief, the collection of measurements presented in this report shows that predictable intermodulation (IM) productions generated by the operation of these stations are less than the maximum allowable level as required by section 73.317(d). Further, the present study investigated possible spurious emissions up to 1 Ghz and found no spurious emissions exceeding allowable levels. Matt Brown of Townsquare Media performed the measurements summarized herein on November 23rd 2021.

The equipment employed to collect the data recorded herein included an Anritsu S332E SiteMaster analyzer in conjunction with the installed directional coupler and any necessary attenuators and notch filters to optimize the dynamic range of the analyzer without exceeding the input power limit of the analyzer. Measurements to verify compliance with section 73.317(d) were made at the directional coupler installed at the output of the combiner system.

Transmission System

The stations included in this combined system are listed in Table 1 where the level of spectral emissions required for 73.317(d) are calculated based on station transmitter power levels at the location of the directional coupler used for measurements.

Transmission System Diagram (Figure 1)



Combiner System Stations Considered in IM Study (Table 1)

Call Sign	Frequency	ERP (kW)	Ref Power Level at Directional Coupler (kW)	Required Level per 73.317(d) $43 + 10\log_{10}(\text{Power})\text{dB}$
K270CT	101.9 MHz	.25	.29	-67.623 dB
K236CX	95.1 MHz	.25	.32	-68.051 dB

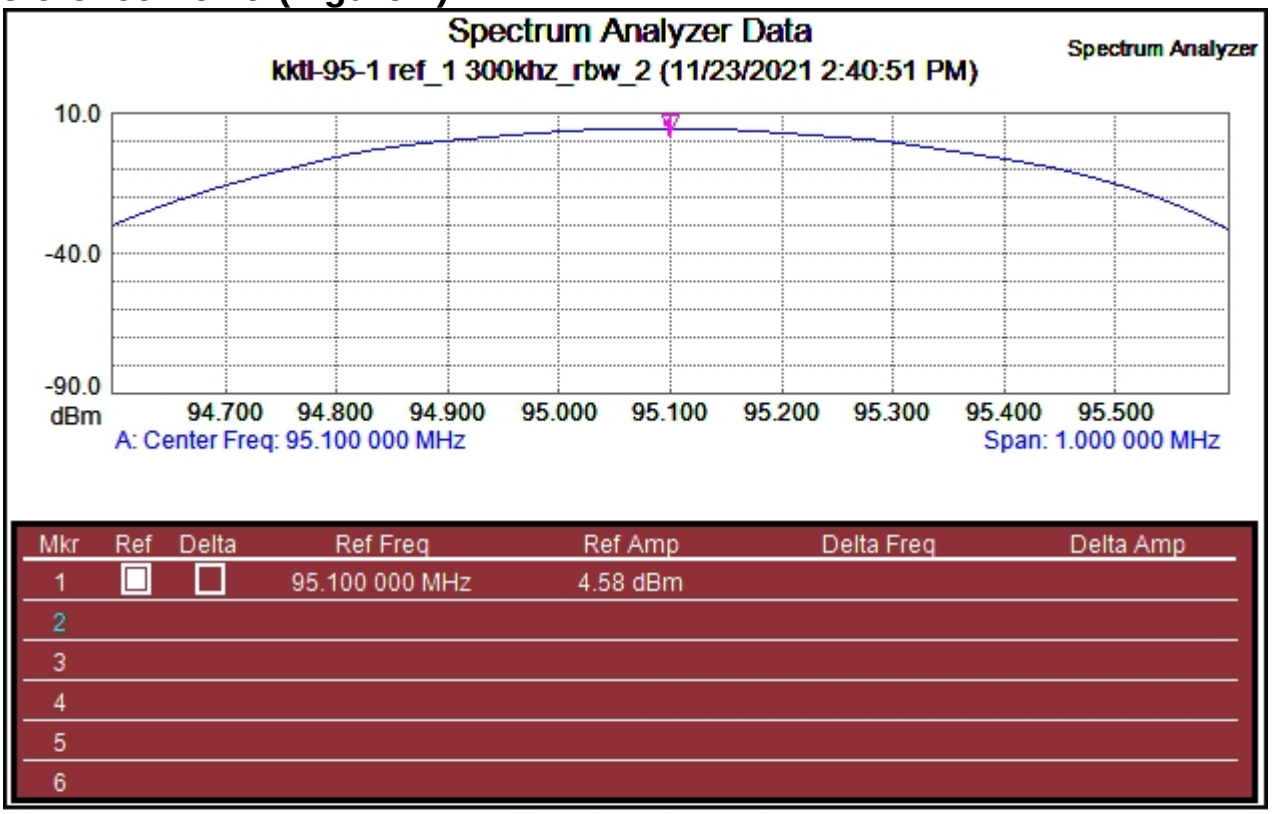
The installed filter/combiner system is designed to provide adequate isolation to ensure that interfering signals and any resulting products are sufficiently attenuated to satisfy the section 73.317(d) requirement. A functional diagram showing the layout of the combined transmission system is illustrated in Figure 1.

All stations operated at licensed power for the duration of compliance measurements. Matt Brown, Engineer, confirmed the operational status of all transmitters during the course of measurements.

The directional coupler used for measurements is factory calibrated with a typical directivity of >50 dB and a coupling level that has a generally flat response across the FM band within approximately +/- 0.5 dB. The coupling level was chosen to ensure signal levels can be adequately measured within the dynamic range of the spectrum analyzer.

The forward ports of the output on the directional coupler were used for sampling all outgoing carrier levels and IM products. The sampled signal was fed by shielded cable into the Anritsu S332E analyzer, and a notch filter for each carrier was utilized after reference levels were obtained. Figure 2 and 3 illustrate the obtained reference levels for each carrier using a method described by NRSC-G201-A, NRCS-5 RF Mask Compliance: Measurement Methods and Practice, National Radio Systems Committee, April 2010.

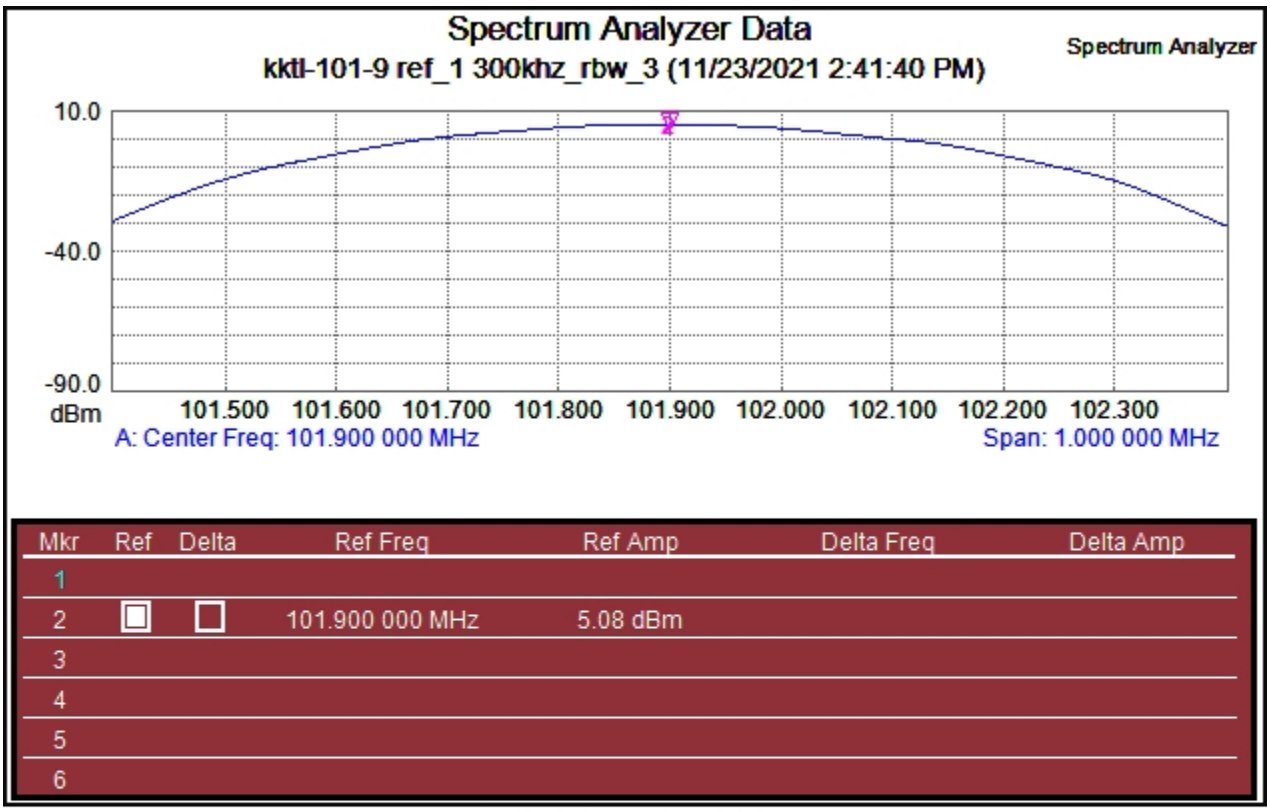
95.1 Reference Power(Figure 2)



Measurement Parameters

		Stop Frequency	95.600 000 MHz
Trace Mode	Normal	Frequency Span	1.000 000 MHz
Preamp	OFF	Reference Level	10.000 dBm
Min Sweep Time	0.001 S	Scale	10.0 dB/div
Reference Level Offset	0 dB	Serial Number	1841035
Input Attenuation	15.0 dB	Base Ver.	V5.92
RBW	300.0 kHz	App Ver.	V7.17
VBW	100.0 kHz	Model	S332E
Detection	Peak	Options	21, 509
Center Frequency	95.100 000 MHz	Date	11/23/2021 2:40:51 PM
Start Frequency	94.600 000 MHz	Device Name	Townsquare Media - St abbert

101.9 Reference Power(Figure 3)



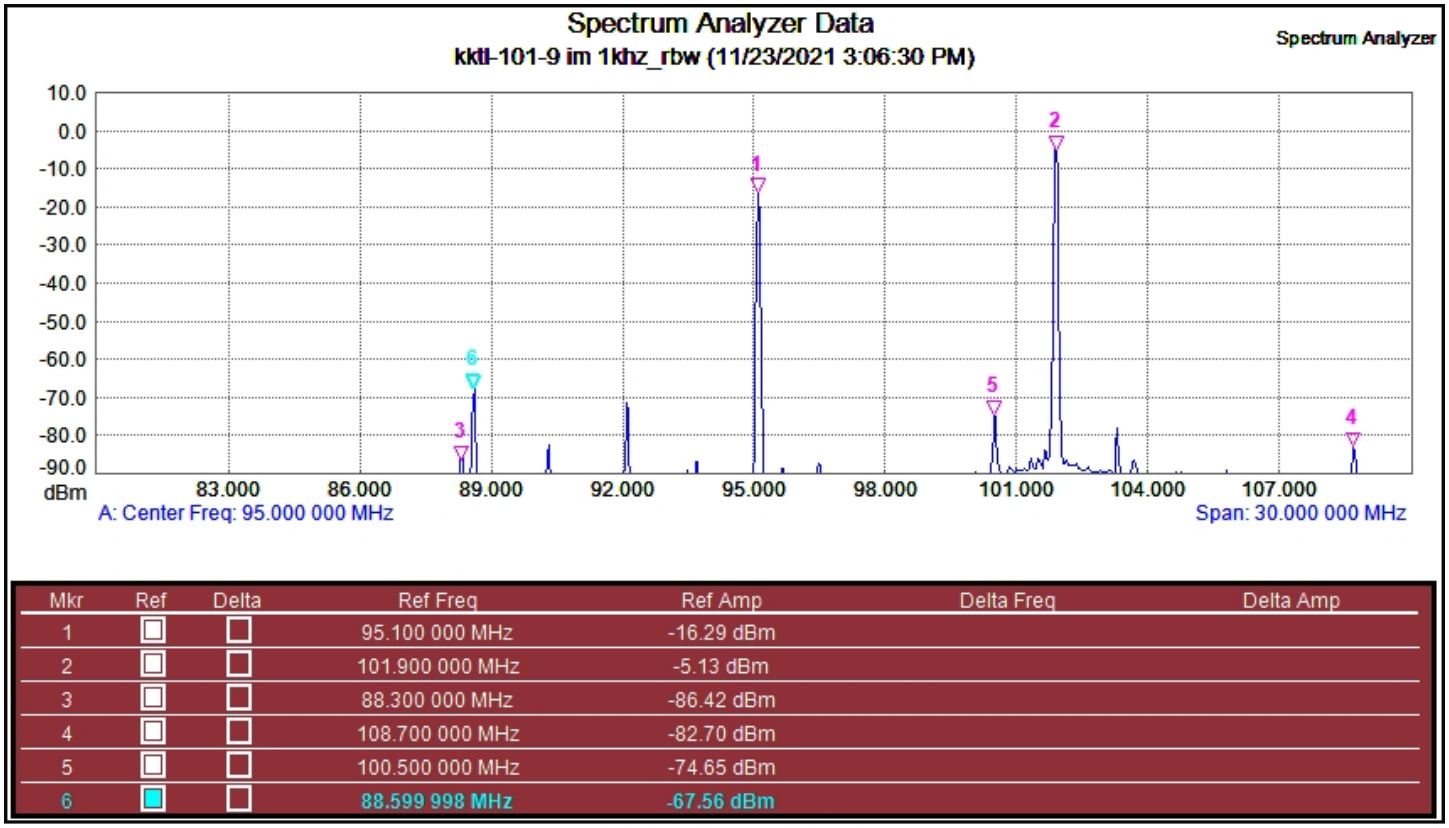
Measurement Parameters

		Stop Frequency	102.400 000 MHz
Trace Mode	Normal	Frequency Span	1.000 000 MHz
Preamp	OFF	Reference Level	10.000 dBm
Min Sweep Time	0.001 S	Scale	10.0 dB/div
Reference Level Offset	0 dB	Serial Number	1841035
Input Attenuation	15.0 dB	Base Ver.	V5.92
RBW	300.0 kHz	App Ver.	V7.17
VBW	100.0 kHz	Model	S332E
Detection	Peak	Options	21, 509
Center Frequency	101.900 000 MHz	Date	11/23/2021 2:41:40 PM
Start Frequency	101.400 000 MHz	Device Name	Townsquare Media - St abbert

Product Measurements

Measurements were made to assess the level of potential intermodulation products that might exist at the output of the combined system with specific attention given to third order IM products of the type 2F1 – F2. Figure 4 shows the FM band noise floor, with nearby channels and potential IM products marked. The collection of measurements presented in this report shows that all possible third order IM products generated by the operation of these stations are less than the maximum allowable levels as required by section 73.317(d), and further, that no products or harmonics exist in excess of required levels. The present study investigated possible spurious emissions up to 1 Ghz and found no spurious emissions exceeding allowable levels.

General IM Product Sweep (Figure 4)



Mkr	Ref	Delta	Ref Freq	Ref Amp	Delta Freq	Delta Amp
1	☐	☐	95.100 000 MHz	-16.29 dBm		
2	☐	☐	101.900 000 MHz	-5.13 dBm		
3	☐	☐	88.300 000 MHz	-86.42 dBm		
4	☐	☐	108.700 000 MHz	-82.70 dBm		
5	☐	☐	100.500 000 MHz	-74.65 dBm		
6	☐	☐	88.599 998 MHz	-67.56 dBm		

Measurement Parameters

		Stop Frequency	110.000 000 MHz
Trace Mode	Normal	Frequency Span	30.000 000 MHz
Preamp	OFF	Reference Level	10.000 dBm
Min Sweep Time	0.001 S	Scale	10.0 dB/div
Reference Level Offset	0 dB	Serial Number	1841035
Input Attenuation	15.0 dB	Base Ver.	V5.92
RBW	1.0 kHz	App Ver.	V7.17
VBW	300.0 Hz	Model	S332E
Detection	Peak	Options	21, 509
Center Frequency	95.000 000 MHz	Date	11/23/2021 3:06:30 PM
Start Frequency	80.000 000 MHz	Device Name	Townsquare Media - St abbert

The relative output signals for the system carriers are measured first to establish reference levels for other measurements. As stated in CFR Title 47, Section 73.317, measurements of spectral emissions are compared to the level of the unmodulated carrier.

Measurements were taken with an unmodulated carrier, however it is sometimes inconvenient to establish this carrier reference level using the actual unmodulated carrier during operation of the station. As an approximation to this, it is generally accepted that the power of the transmitter output can be estimated from the modulated signal using a 300 khz resolution bandwidth which serves to integrate the power in the modulated signal. This method of establishing the carrier reference level is used here as a basis for comparing the potential IM product levels.

The potential third-order product frequencies for the combined system are calculated and listed in Table 2.

Potential Third-Order IM Products {2F1-F2} (Table 2)

[MHz]	F2, 95.1	F2, 101.9
F1, 95.1	--	88.3
F1, 101.9	108.7	--

The reference signal level for each transmitter as recorded at the output directional coupler are listed in Table 3 and are used as the reference level for possible IM products.

Transmitter Forward Power Reference Levels (Table 3)

Call Sign	Frequency	Transmitter Forward Reference 300kHz RBW
K270CT	101.9 MHz	5.08 dBm
K236CX	95.1 MHz	4.58 dBm

IM product measurements recorded (Table 4)

Carrier Frequency F1 [MHz]	Carrier Frequency F2 [MHz]	2F1-F2 Product Frequency [MHz]	Carrier Reference Level [dBm]	Measured Level (1kHz RBW) [dBm]	Target Level [dBm]	Level OK by [dB]
95.1	101.9	88.3	4.58	-86.42	-67.623	18.8
101.9	95.1	108.7	5.08	-82.70	-68.051	14.65

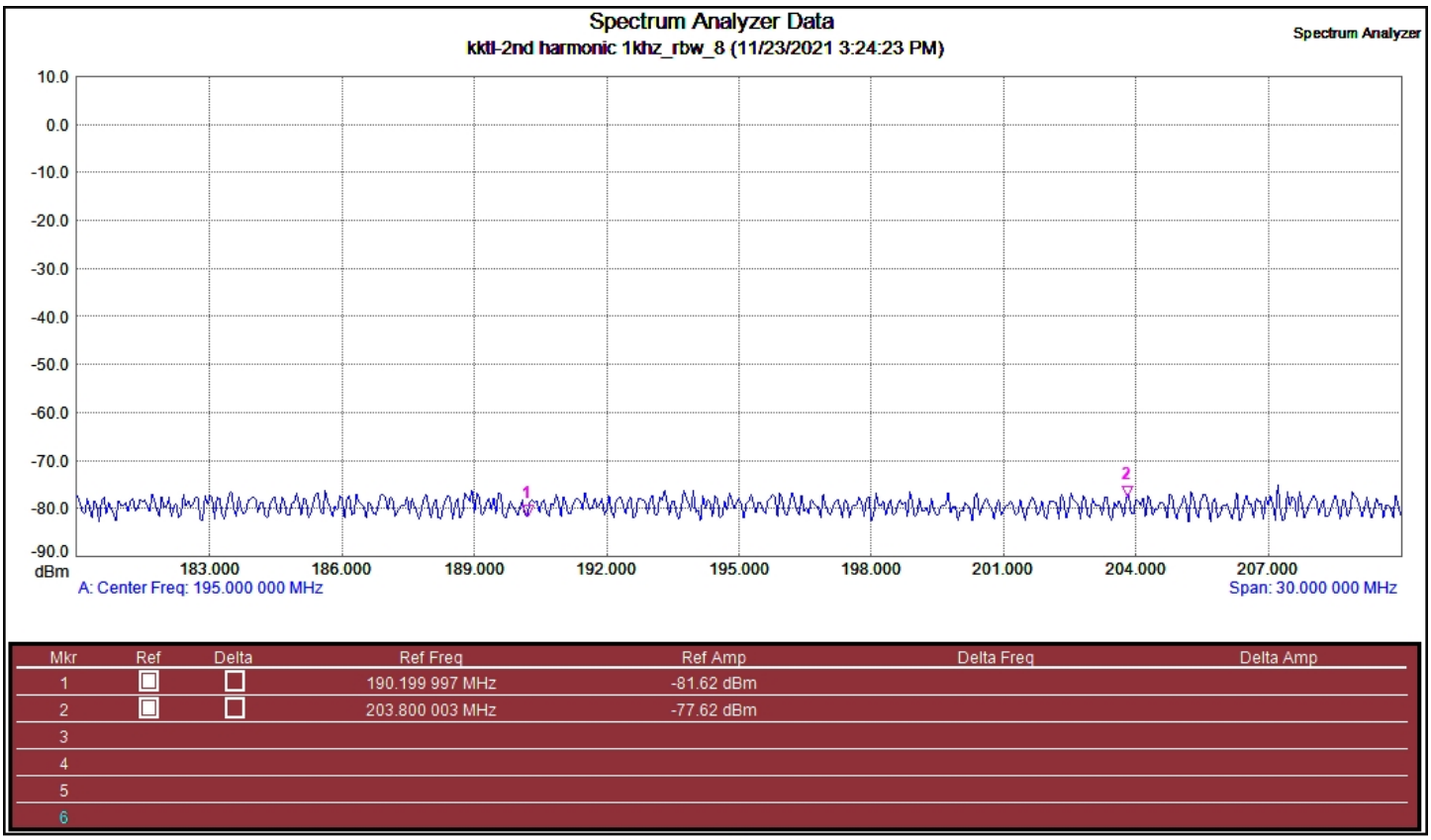
Harmonic product measurements (Table 5)

		2nd Harmonic			3rd Harmonic		
Carrier Frequency [MHz]	Target Level [dBm]	Frequency [MHz]	Measured Level (1kHz RBW) [dBm]	Level OK by [dB]	Frequency [MHz]	Measured Level (1kHz RBW) [dBm]	Level OK by [dB]
95.1	-67.623	190.2	-81.62	14.00	285.3	-80.57	12.95
101.9	-68.051	203.8	-77.62	9.57	305.7	-81.69	13.63

Figures5-8 show the FM band with carrier and IM products indicated. Sweeps are shown for the intermodulation products studied.

All product levels for the combined system meet requirements.

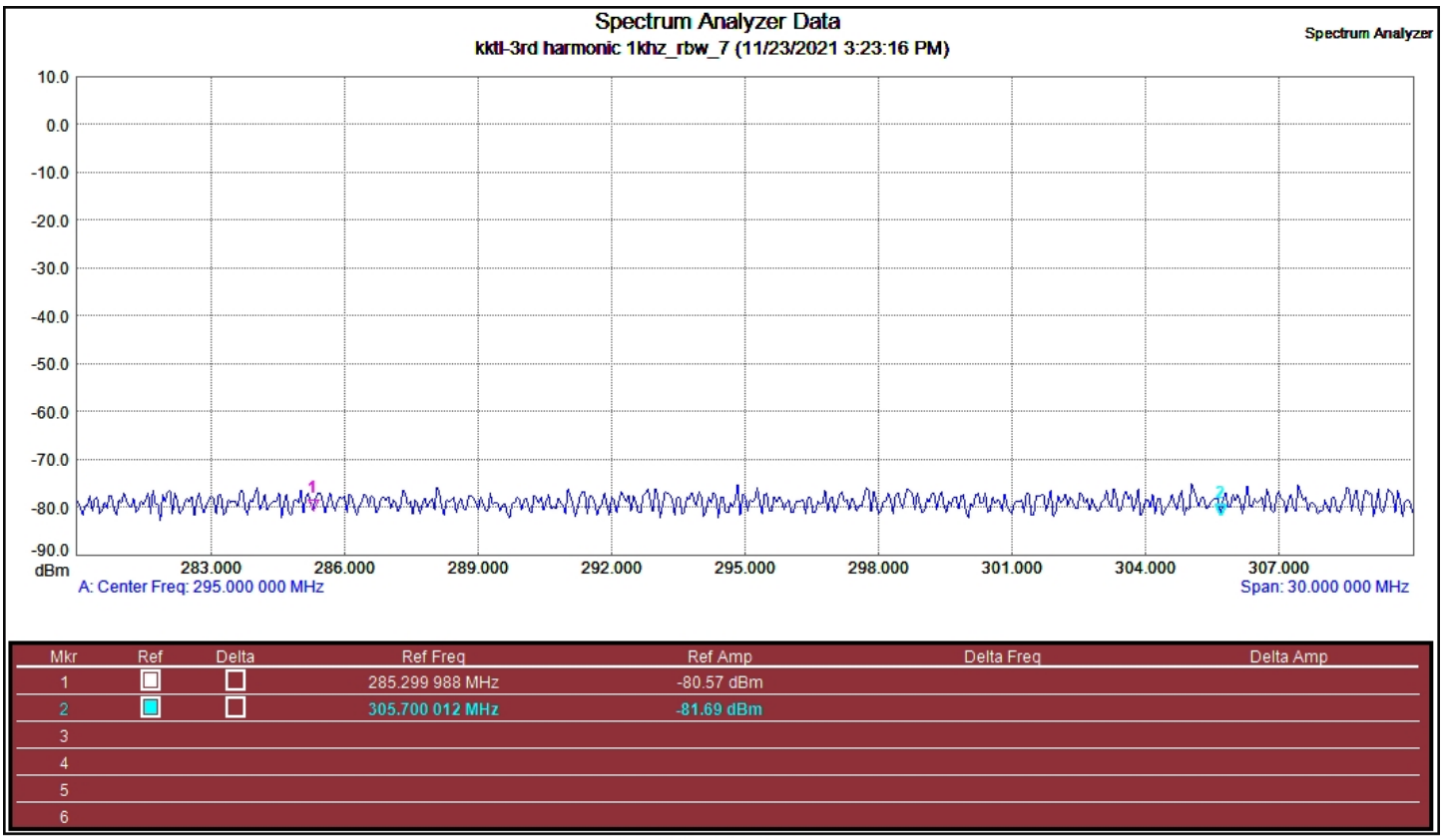
Second Harmonic Measurements (Figure 5)



Measurement Parameters

		Stop Frequency	210.000 000 MHz
Trace Mode	Normal	Frequency Span	30.000 000 MHz
Preamp	OFF	Reference Level	10.000 dBm
Min Sweep Time	0.001 S	Scale	10.0 dB/div
Reference Level Offset	0 dB	Serial Number	1841035
Input Attenuation	30.0 dB	Base Ver.	V5.92
RBW	1.0 kHz	App Ver.	V7.17
VBW	300.0 Hz	Model	S332E
Detection	Peak	Options	21, 509
Center Frequency	195.000 000 MHz	Date	11/23/2021 3:24:23 PM
Start Frequency	180.000 000 MHz	Device Name	Townsquare Media - St abbert

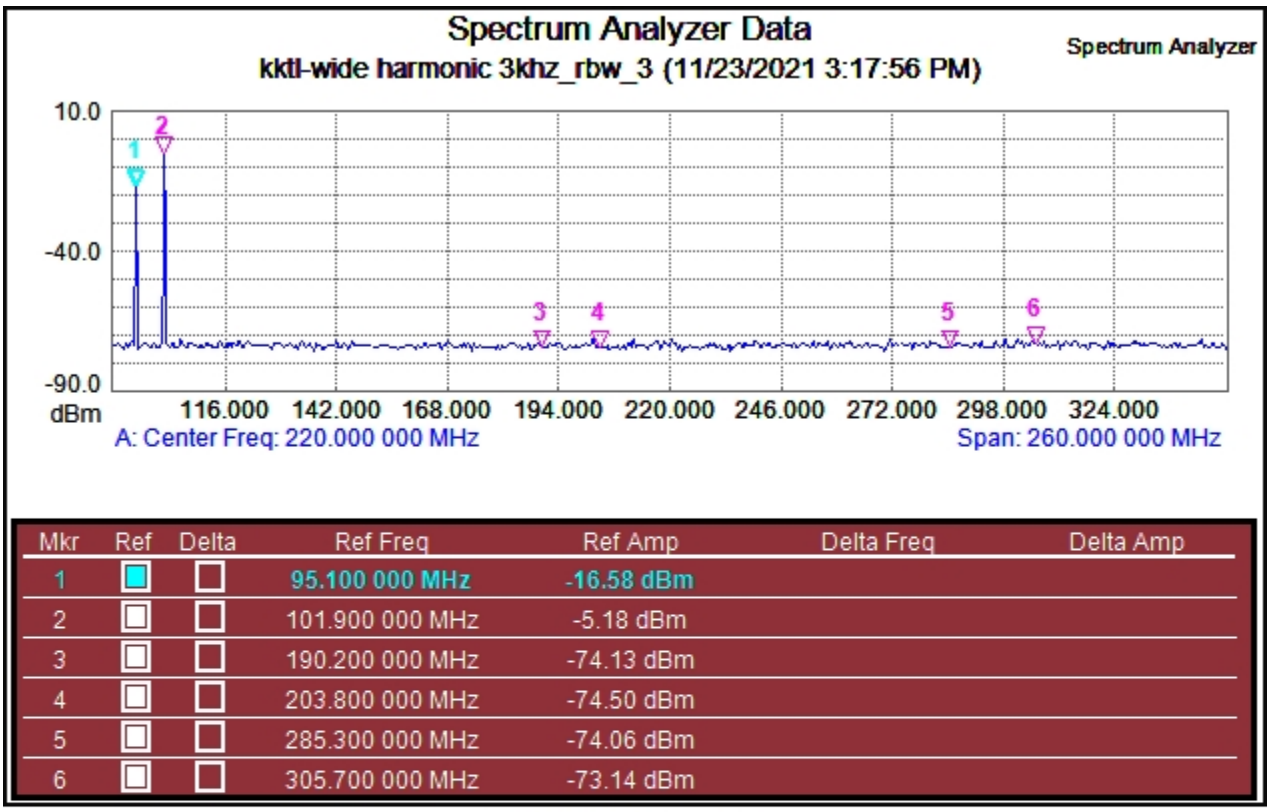
Third Harmonic Measurements (Figure 6)



Measurement Parameters

		Stop Frequency	310.000 000 MHz
Trace Mode	Normal	Frequency Span	30.000 000 MHz
Preamp	OFF	Reference Level	10.000 dBm
Min Sweep Time	0.001 S	Scale	10.0 dB/div
Reference Level Offset	0 dB	Serial Number	1841035
Input Attenuation	30.0 dB	Base Ver.	V5.92
RBW	1.0 kHz	App Ver.	V7.17
VBW	300.0 Hz	Model	S332E
Detection	Peak	Options	21, 509
Center Frequency	295.000 000 MHz	Date	11/23/2021 3:23:16 PM
Start Frequency	280.000 000 MHz	Device Name	Townsquare Media - St abbert

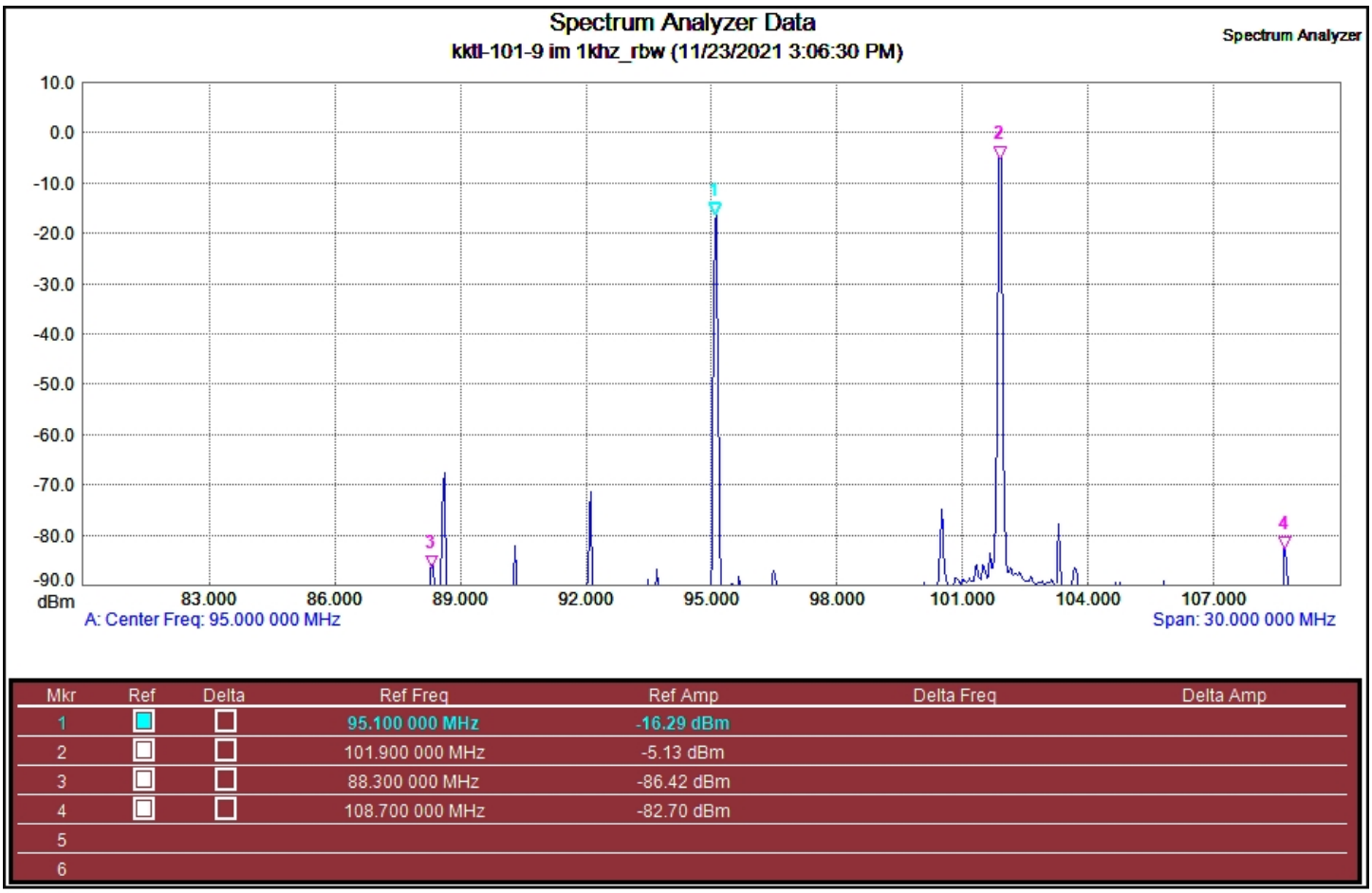
Harmonic Overview (Figure 7)



Measurement Parameters

		Stop Frequency	350.000 000 MHz
Trace Mode	Normal	Frequency Span	260.000 000 MHz
Preamp	OFF	Reference Level	10.000 dBm
Min Sweep Time	0.001 S	Scale	10.0 dB/div
Reference Level Offset	0 dB	Serial Number	1841035
Input Attenuation	30.0 dB	Base Ver.	V5.92
RBW	3.0 kHz	App Ver.	V7.17
VBW	1.0 kHz	Model	S332E
Detection	Peak	Options	21, 509
Center Frequency	220.000 000 MHz	Date	11/23/2021 3:17:56 PM
Start Frequency	90.000 000 MHz	Device Name	Townsquare Media - St abbert

IM Frequencies Compared to Carriers (Figure 8)



Mkr	Ref	Delta	Ref Freq	Ref Amp	Delta Freq	Delta Amp
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3	☐	☐	88.300 000 MHz	-86.42 dBm		
4	☐	☐	108.700 000 MHz	-82.70 dBm		
5						
6						

Measurement Parameters

		Stop Frequency	110.000 000 MHz
Trace Mode	Normal	Frequency Span	30.000 000 MHz
Preamp	OFF	Reference Level	10.000 dBm
Min Sweep Time	0.001 S	Scale	10.0 dB/div
Reference Level Offset	0 dB	Serial Number	1841035
Input Attenuation	15.0 dB	Base Ver.	V5.92
RBW	1.0 kHz	App Ver.	V7.17
VBW	300.0 Hz	Model	S332E
Detection	Peak	Options	21, 509
Center Frequency	95.000 000 MHz	Date	11/23/2021 3:06:30 PM
Start Frequency	80.000 000 MHz	Device Name	Townsquare Media - St abbert

Conclusion

Based upon the observations and measurements recorded in this document, I, Matt Brown find the operation of the combined FM system for stations K270CT and K236CX as described herein and located at the Casper Wyoming Townsquare Media site near Mills, WY to be in compliance with the requirements of CFR Title 47, Section 73.317 as related to generation of intermodulation products.

Respectfully submitted by Matt Brown, Engineer, Townsquare Media

Matthew Brown

Matt Brown November 23rd 2021