Columbia FM, Inc.
W234BH, Hazleton, PA -- Facility ID 141502
Spurious Emission Measurements

Introduction

These measurements are submitted to the FCC to satisfy a special operating condition in Construction Permit 0000107704, which reads:

BEFORE PROGRAM TESTS COMMENCE, sufficient measurements shall be made to establish that the operation authorized in this construction permit is in compliance with the spurious emissions requirements of 47 C.F.R. Sections 73.317(b) through 73.317(d). All measurements must be made with all stations simultaneously utilizing the shared antenna. These measurements shall be submitted to the Commission along with the FCC Form 350-FM application for license.

W234BH does not use a shared antenna, however, its independent Kathrein/Scala Model CA2-FM/CP transmit antenna is installed on the westernmost leg of the tower approximately 4 meters below the antenna of FM Booster WGGY-FM3 (Facility ID 203403) which is also mounted on that leg, and several meters above the antenna of FM Translator W300BY (Facility ID 156246) which is mounted on the easternmost leg. The tower is registered to Jordan Realty under ASR number 1232866. A local land-mobile radio service company associated with Jordan Realty is responsible for maintenance of some of the repeater equipment at this site.

On August 18, 2020, the W234BH transmit antenna, transmission line, and transmitter were installed at the site, along with a TX/RX Systems model 11-29-05 single cavity bandpass filter between the transmitter output and transmission line. At that time, it was noted that neither WGGY-FM3 nor W300BY had installed external bandpass filters on their respective transmitters. Return loss of the TX/RX Systems single cavity filter at +/- 75 kHz from the W234BH channel center was found to be unacceptable, causing significant fluctuations in reflected power, so the audio modulation was temporarily reduced to a level that the transmitter would tolerate. After considering various solutions, a custom dual cavity bandpass filter, Model 9507-94.7/2/0.2 was ordered from Microwave Filter Company (MFC), East Syracuse, NY. Its test sheet is attached below.

The MFC dual cavity filter was installed on October 5, 2020 and attached spectrum analyzer measurements were taken immediately thereafter, showing compliance with applicable spurious emission requirements.

Test Equipment and Procedure

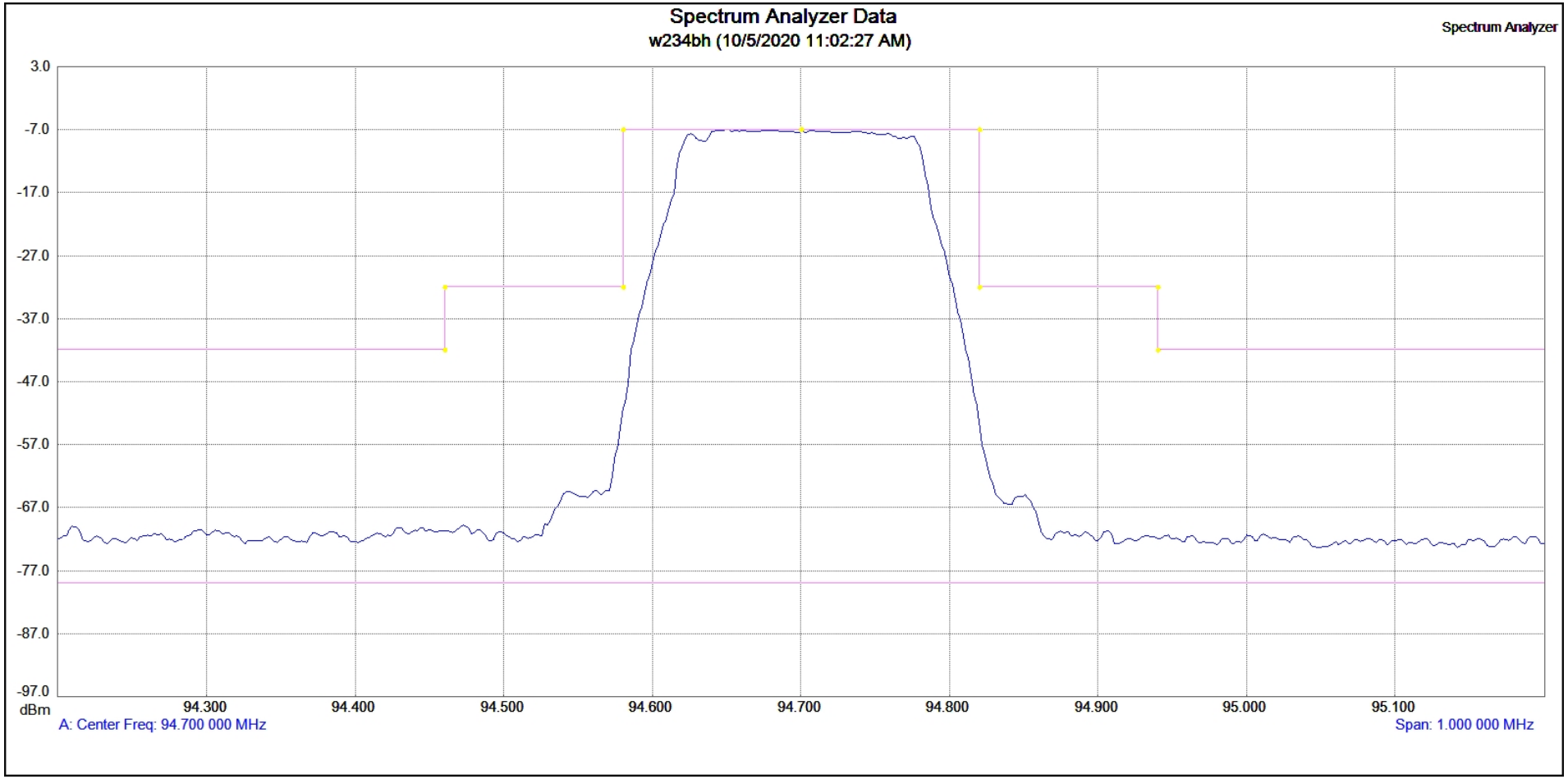
With the W234BH translator operating at specified power output with typical program audio modulation, and other stations at the site operating normally, RF energy was sampled at a point between the output of the transmitter and input to the bandpass filter with a Bird 25-1000 MHz 50 dB non-directional sample element fitted in a Bird

4304A "Thruline" wattmeter. The RF sample was fed to an Anritsu Model MS2721B spectrum analyzer and the following three plots were saved in memory for inclusion in this report.

The first plot, labeled "w234bh" shows compliance with the 73.317(b) and (c) emission mask within +/- 500 kHz of channel center.

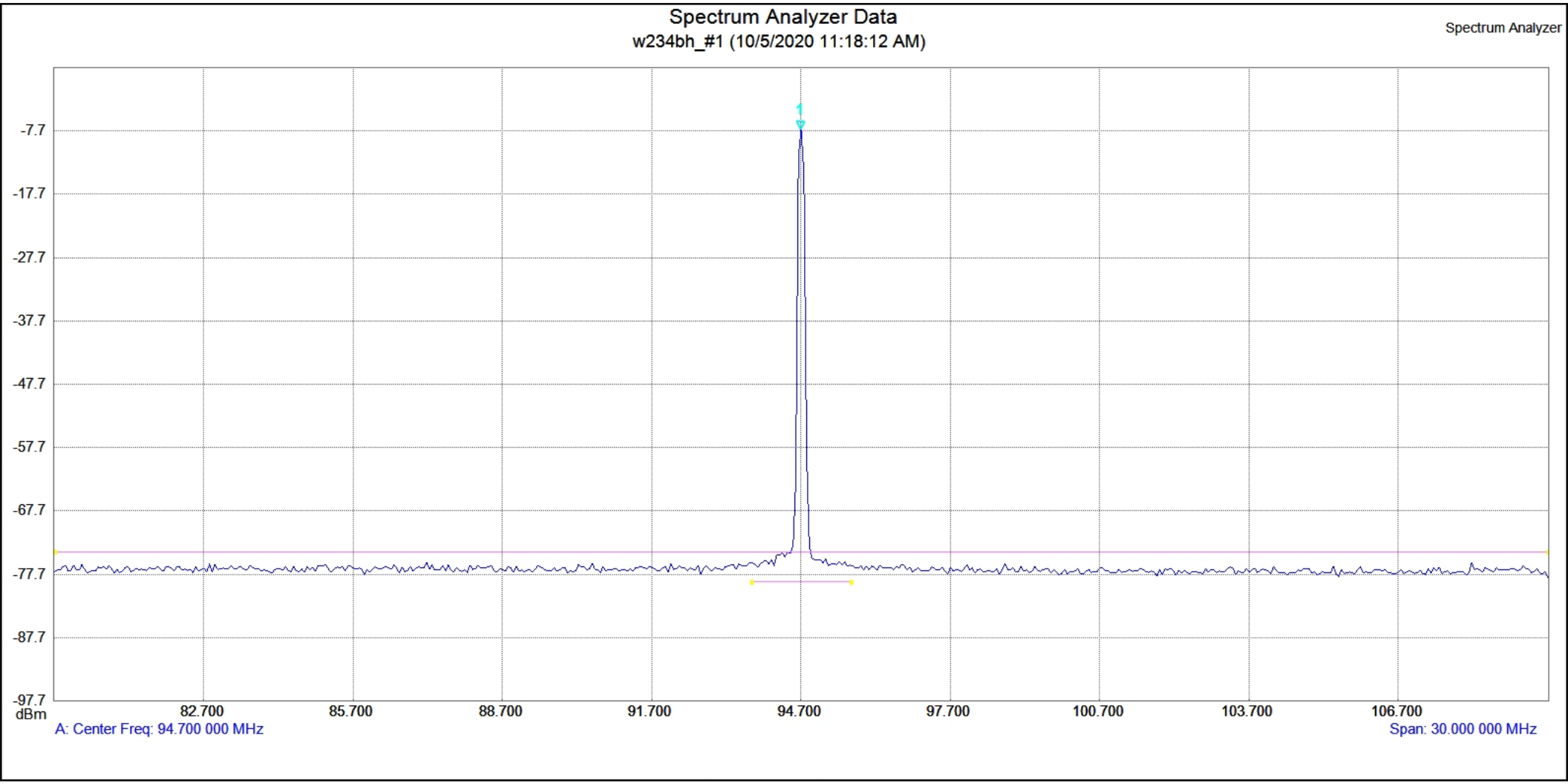
The second plot, labeled "w234bh_#1" shows compliance with the 73.317(c) and (d) emission mask within +/- 15 MHz of channel center. This span covers the range from 79.7 MHz to 109.7 MHz, including the entire FM Broadcast band. For stations operating at 250 watts, the applicable limit at frequencies removed from the carrier by more than 600 kHz is -67 dB, represented by the horizontal red line at -74 dBm on this analyzer plot. Note also the absence of other FM Broadcast signals that could couple into the transmit antenna and back-feed the transmitter output.

The third plot, labeled "w234bh_#2" shows compliance with the 73.317(d) emission mask across a span from 92 MHz to 192 MHz, including the VHF aeronautical and "High-band Land Mobile" segments. Please note the absence of other signals in this range and see statement below concerning repeater input interference.



Measurement Parameters

		Stop Frequency	95.200 000 MHz
Trace Mode	Max Hold	Frequency Span	1.000 000 MHz
Preamp	OFF	Reference Level	3.000 dBm
Min Sweep Time	10 S	Scale	10.0 dB/div
Reference Level Offset	0 dB	Serial Number	1010073
Input Attenuation	25.0 dB	Base Ver.	V5.71
RBW	10.0 kHz	App Ver.	V5.73
VBW	1.0 MHz	Model	MS2721B
Detection	Peak	Options	20
Center Frequency	94.700 000 MHz	Date	10/5/2020 11:02:27 AM
Start Frequency	94.200 000 MHz	Device Name	



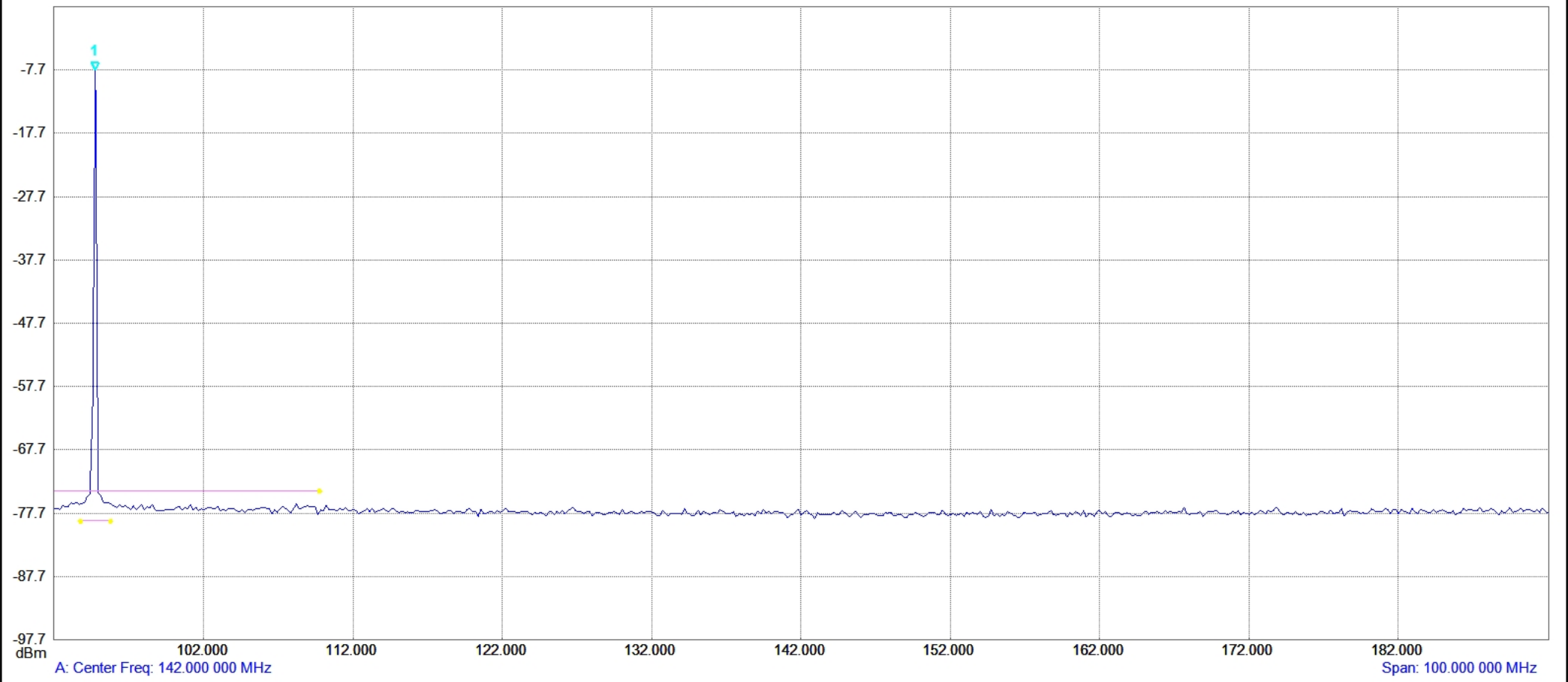
Measurement Parameters

Trace A data:Trace Average	10	Stop Frequency	109.700 000 MHz
Trace Mode	Average	Frequency Span	30.000 000 MHz
Preamp	OFF	Reference Level	2.317 dBm
Min Sweep Time	10 S	Scale	10.0 dB/div
Reference Level Offset	0 dB	Serial Number	1010073
Input Attenuation	25.0 dB	Base Ver.	V5.71
RBW	10.0 kHz	App Ver.	V5.73
VBW	1.0 MHz	Model	MS2721B
Detection	Peak	Options	20
Center Frequency	94.700 000 MHz	Date	10/5/2020 11:18:12 AM
Start Frequency	79.700 000 MHz	Device Name	

Spectrum Analyzer Data

w234bh_#2 (10/5/2020 11:24:34 AM)

Spectrum Analyzer



Measurement Parameters

Trace A data:Trace Average	10	Stop Frequency	192.000 000 MHz
Trace Mode	Average	Frequency Span	100.000 000 MHz
Preamp	OFF	Reference Level	2.317 dBm
Min Sweep Time	10 S	Scale	10.0 dB/div
Reference Level Offset	0 dB	Serial Number	1010073
Input Attenuation	25.0 dB	Base Ver.	V5.71
RBW	10.0 kHz	App Ver.	V5.73
VBW	1.0 MHz	Model	MS2721B
Detection	Peak	Options	20
Center Frequency	142.000 000 MHz	Date	10/5/2020 11:24:34 AM
Start Frequency	92.000 000 MHz	Device Name	

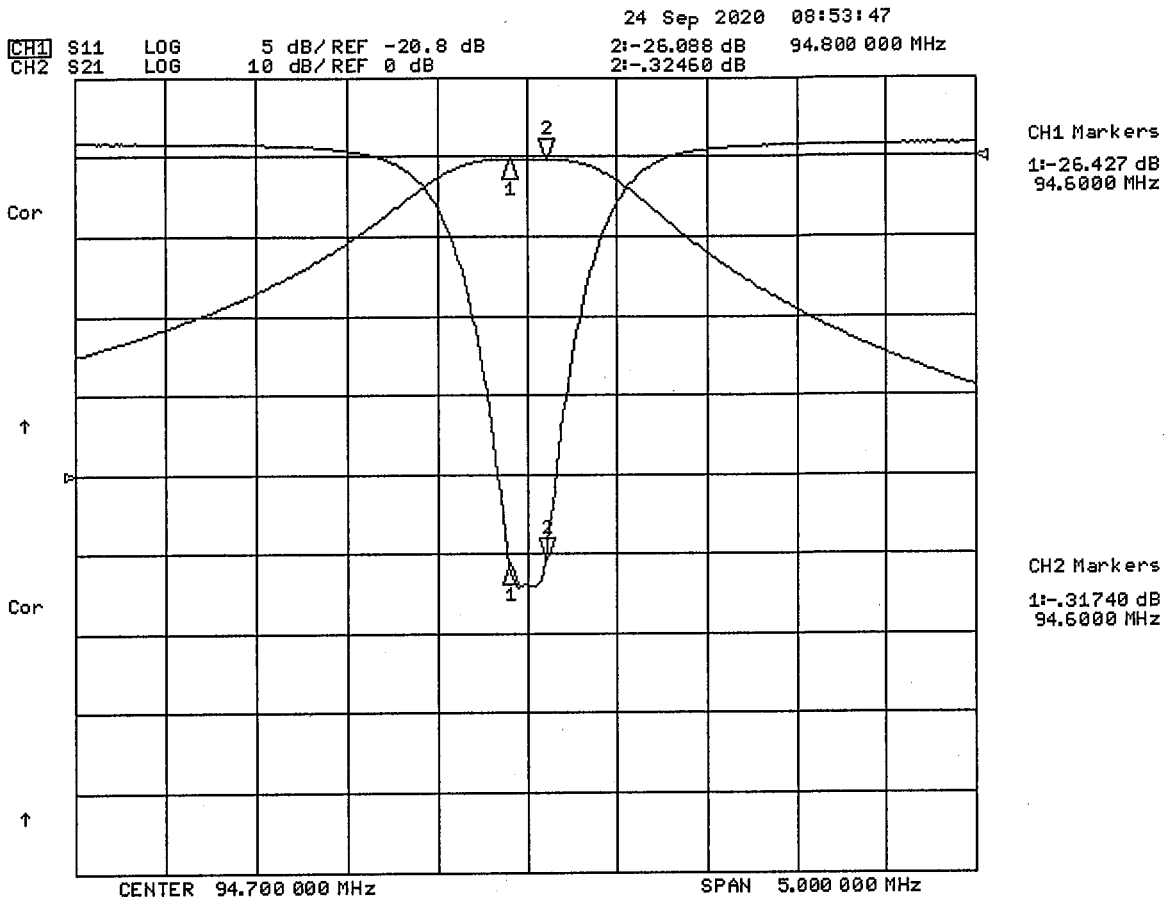
Repeater Input Interference

When the MFC dual cavity filter was installed on October 5, 2020, the W234BH/WBWX contract engineer was informed of low level intermodulation interference affecting the 158.8175 MHz input frequency of one of the collocated land mobile repeaters. This product is apparently generated by an "A-B+C" third-order mix between the repeater's control channel transmit frequency of 152.2175 MHz, W234BH transmitting on 94.7 MHz, and WGGY-FM3 transmitting on 101.3 MHz. The site owner contacted the licensee of WGGY-FM3 later that month to request installation of a bandpass filter. This reduced the amplitude of the product by approximately 5 dB but did not completely eliminate it. Subsequent tests suggest that the product is the result of "passive intermodulation", possibly caused by corroded metal near the affected antennas, a problem that cannot be corrected with additional filters. The licensee of W234BH has been cooperating with the site owner by temporarily reducing its transmitter power, but will relocate the antenna or the entire facility if this interference cannot be resolved.

Conclusion

According to these measurements made on October 5, 2020, the emissions measured at the output of the transmitter presently in use by W234BH comply with requirements of 73.317 for occupied bandwidth and spurious emissions.

(Test Data for the MFC Dual Cavity Filter follows)



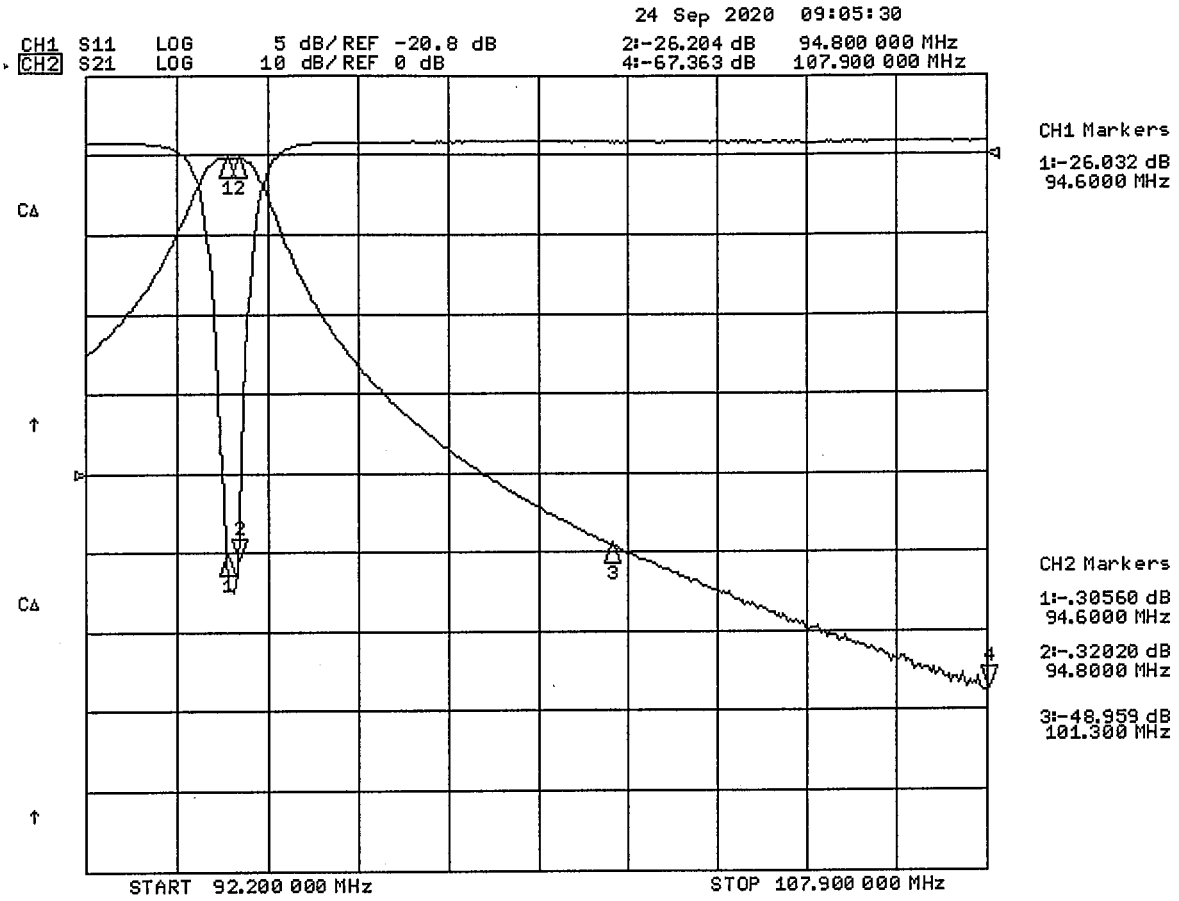
IN PROCESS TEST / (FINAL TEST)

PN 9507-94-7/2/0.2

DATE 9/24/20

TESTED BY: Greg Groce

(PASS) / FAIL



IN PROCESS TEST / FINAL TEST

PN 9507-94.2/2/0.2

MC DATE 9/24/20

TESTED BY: Greg Groce

PASS / FAIL