

# W243DX Measurements of RF Emissions December 2017

## Introduction

These measurements are provided to the FCC in response to Condition 3 of Construction Permit BPFT-20171117AAF, 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.

## Translator Specifications

W243DX, Buffalo, NY, Facility ID 147327  
Construction Permit BPFT-20171117AAF  
Output Frequency 96.5 MHz  
Transmitter Output Power 58 W  
Effective radiated power 35 Watts H and V  
Required attenuation of emissions greater than 600 kHz removed: **60.63 dBc**

W275BB, Cheektowaga, NY, Facility ID 151157  
Construction Permit BPFT-20170918ADN  
Output Frequency 102.9 MHz  
Transmitter power 272 W  
Effective radiated power 220 Watts H and V  
Required attenuation of emissions greater than 600 kHz removed: **67.35 dBc**

## Introduction

The Bext Model FDCSDC03 starpoint combiner installed earlier this year between the output of each transmitter and the transmission line input was retained. Transmitter power output of W234DX was doubled to 58 watts from the previous licensed value of 29 watts, to account for the 3 dB reduction in antenna gain. (The "Slant-45" orientation of the antenna divides power equally between the vertical and horizontal polarizations.)

## Test Equipment and Procedure

The emissions of both translator stations were sampled at a point between the output of the transmit combiner and input to the 50 ohm transmission line with a Coaxial Dynamics directional broadband sample element fitted in a Bird 4304A "Thruline" wattmeter. Particular attention was given to the third-order

intermodulation ("IM3") products that could result from a 2A-B mix between the two transmit frequencies.

For W243DX, the most significant IM3 product is  $(96.5 \times 2) - 102.9 = 90.1$  MHz  
For W275BB, the most significant IM3 product is  $(102.9 \times 2) - 96.5 = 109.3$  MHz

(Please note that the W243DX/W275BB antenna is located atop the tallest building in downtown Buffalo, NY, within several kilometers of numerous full-service FM stations operating at powers as high as 75 kW. Therefore, the combiner output is backfed with energy from those external sources. **Figure 1** shows the resulting baseline spectral plot between 88 and 108 MHz recorded in August 2017 with the W243DX and W275BB transmitters powered off. These incoming signals should be disregarded, as they do not result from operation of the translator stations.)

To establish carrier reference levels for each station, the RF sample was fed directly to the input of a Rohde & Schwarz FSH-3 spectrum analyzer, set for 300 kHz resolution bandwidth. **Figure 2** shows a reference of +8.2 dBm for W243DX and +15.4 dBm for W275BB.

A 3 dB attenuator and notch filter tuned to reject 96.5 MHz were inserted between the sample element and the input of the spectrum analyzer to reduce the W243DX fundamental signal by approximately 15 dB to prevent false intermodulation products from being generated within the analyzer's front end. The bandwidth of the spectrum analyzer was narrowed to 100 kHz for better resolution, and the sensitivity of the analyzer was increased.

The IM3 product at 90.1 MHz indicated on the analyzer in **Figure 3** was -62.1 dBm. Taking the 3 dB attenuator loss and 2 dB insertion loss of the filter into account, the 90.1 MHz product was measured at 65.3 dB below the unmodulated carrier of W243DX and 72.5 below that of W275BB.

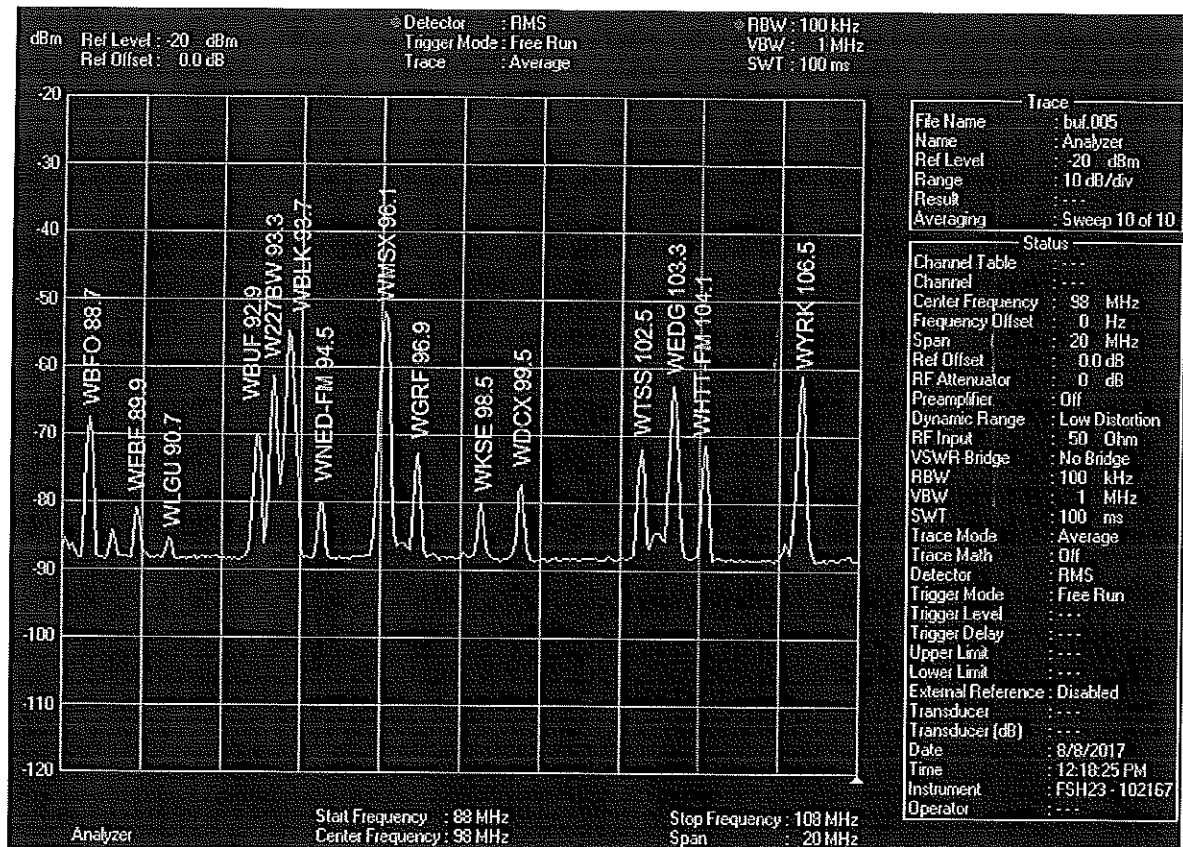
The notch filter was tuned to reject 102.9 MHz to reduce the W275BB fundamental signal, to prevent false intermodulation products from being generated within the analyzer's front end. The IM3 product at 109.3 MHz as shown on the analyzer in **Figure 4** was -66.0 dBm. Taking the 3 dB attenuator and 2 dB correction factors into account, the 90.1 MHz product was measured at 76.4 dB below the unmodulated carrier of W275BB and 69.2 dB below that of W243DX.

The following harmonic levels were measured:

W243DX 2nd Harmonic	193.0 MHz	-77.2 dBc
W243DX 3rd Harmonic	289.5 MHz	-87.6 dBc
W275BB 2nd Harmonic	205.8 MHz	-79.7 dBc
W275BB 3rd Harmonic	308.7 MHz	-94.4 dBc

Occupied bandwidth of each translator was measured with the analyzer in peak hold mode for several minutes, and found to comply with the -25 dB limit between 120 and 240 kHz removed from carrier, and the -35 dB limit between 240 and 600 kHz removed from carrier.

This 35 dB limit also applies to a third-order product at 96.9 MHz generated in the W243DX transmitter as a result of intermodulation with an incoming signal at 96.1 MHz that is backfed into the antenna from WMSX, which transmits from a building several blocks away. **Figure 5** shows the product at -47.4 dBm or -55.6 dB relative to the W243DX carrier.



**Figure 1**

Baseline FM Broadcast Spectrum measurement with W243DX and W275BB transmitters shut off. These incoming signals were received from other local stations and some of them appear in Figures 2 through 5 below.

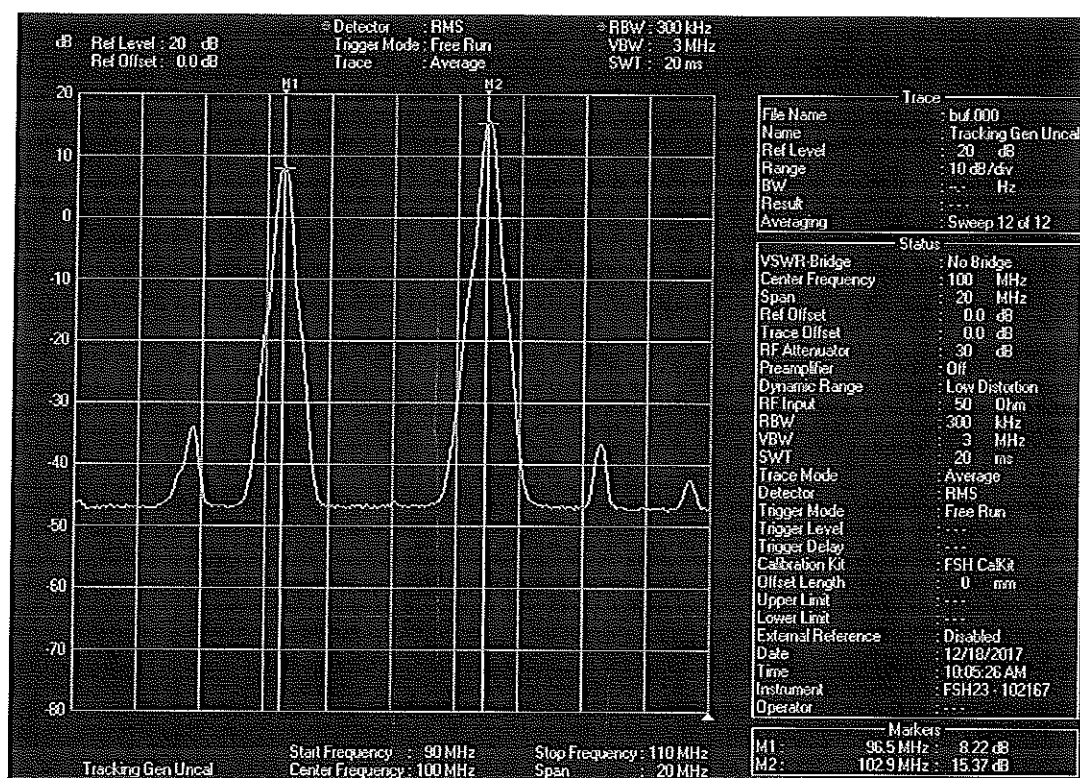


Figure 2

Carrier Reference Level measurement of W243DX at 96.5 MHz and W275BB at 102.9 MHz.

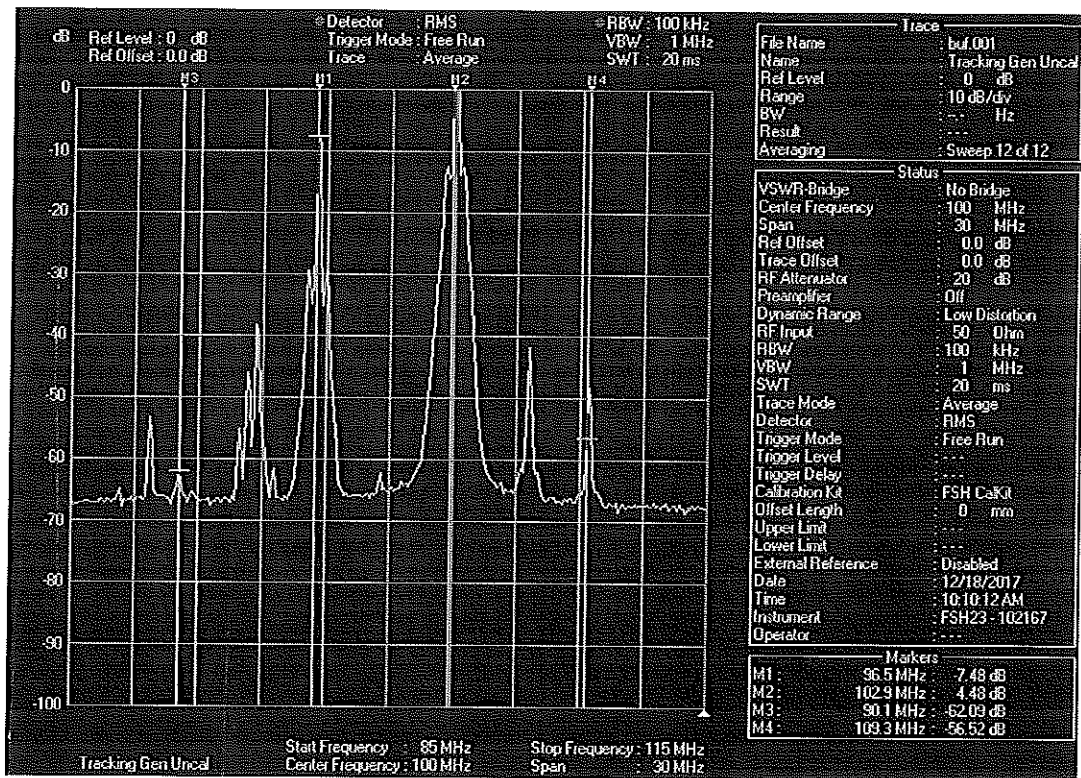


Figure 3

Measurement of third-order intermodulation product at 90.1 MHz with 3 dB attenuator and 96.5 MHz notch filter in line.

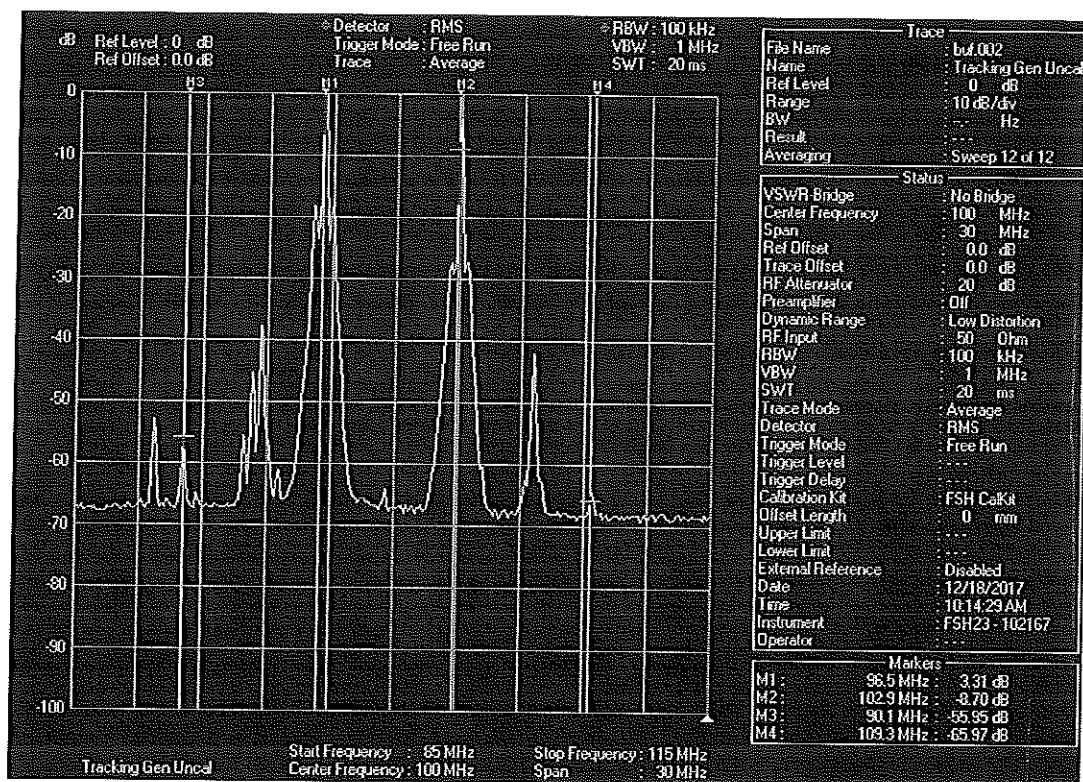


Figure 4

Measurement of third-order intermodulation product at 109.3 MHz with 3 dB attenuator and 102.9 MHz notch filter in line.

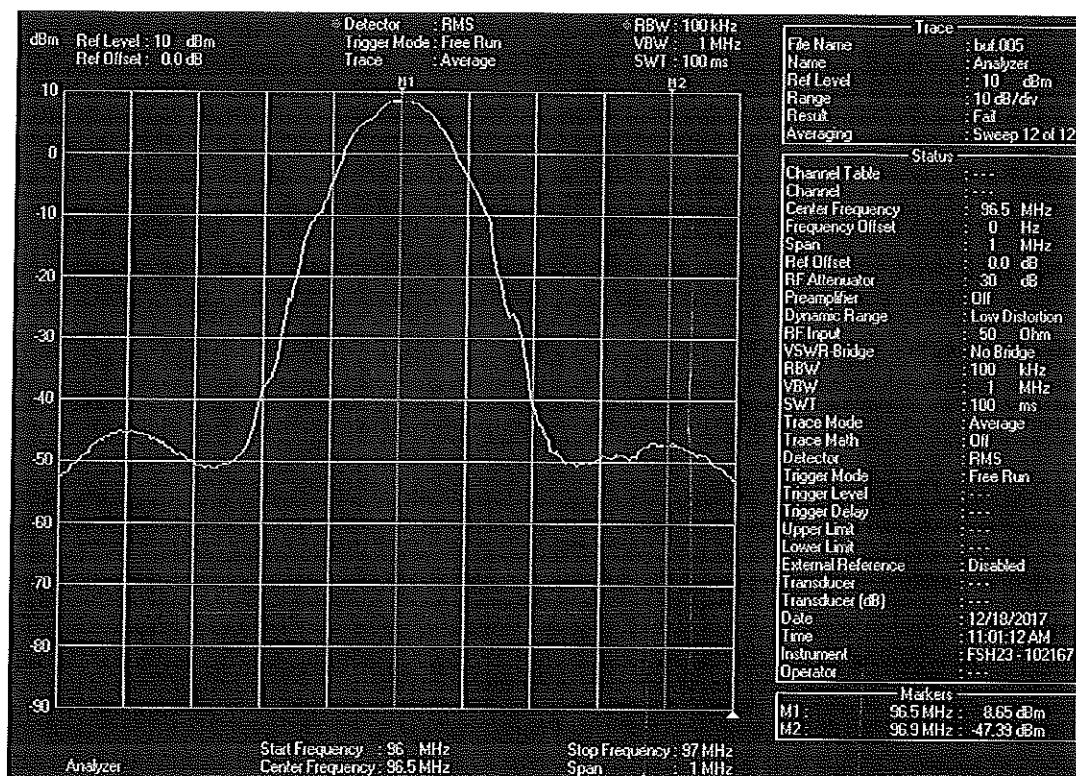


Figure 4

Measurement of third-order intermodulation product at 96.9 MHz resulting from mix with 96.1 MHz backfed from WMSX. No notch filter in line.

### Carrier Frequency Measurements

The center frequency of each translator was measured with an Optoelectronics 3000A Plus counter, calibrated in May 2017 against a 10 MHz GPS clock, and verified against NIST station WWV.

W243DX: 96.5000489 MHz

W275BB: 102.8997390 MHz

### Conclusion

According to these measurements made by me on December 18, 2017, the W243DX/W275BB translator facilities comply fully with applicable FCC requirements for occupied bandwidth and spurious emissions.

/s/

Mark D. Humphrey, CPBE

Technical Consultant

December 20, 2017