

# ***MUNN – REESE***

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July 27, 2022

Attn: Kevin Hawley

Re: FM occupied Spectrum Measurements

Attached, please find the FM Occupied Spectrum Analysis report for your station. This field measurement includes a check for compliance with FCC § 73.317 FM transmission system requirements, along with the annual spurious and harmonic checks required for the station. This information is to be kept on file (public and engineering) at the station in the event an FCC inspector requests it. No filing of this data with the FCC in Washington is required.

I am pleased to report that the station passed all of the measurement tests for this calendar year. I am supplying you with an original pdf copy of the spectrum analyzer results. Feel free to make as many copies as deemed necessary. The charge for this service is \$450.00 and an invoice will follow at a later date.

If you have questions regarding this information, please don't hesitate to contact Mr. Ed Trombley, field engineer, or myself.

Sincerely,



Bruce Bellamy, President

**ENGINEERING REPORT  
FM OCCUPIED SPECTRUM ANALYSIS**

CFR 47 §73.317 Compliance

**W227DO – Lansing, MI**

**Facility ID # 200896**

**93.9 MHz**

**July 2022**

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## **FM OCCUPIED SPECTRUM ANALYSIS**

### **Station Data**

Call: W227DO

Frequency: 93.3 MHz

City of License: Grand Rapids, MI

Channel: 227D

Service: FM

Facility ID: 200896

Effective Radiated Power: 0.125 kW

Antenna Mode: Omni-Directional

Measurement Date: 07/20/2022

### **Discussion:**

The measurement data obtained for this report indicates the operation of W227DO to be IN COMPLIANCE with the provisions of CFR 47 §73.317 of the FCC rules regarding FM Broadcast Stations. Occupied Spectrum measurements taken during the regular broadcast day by Edmond R. Trombley, staff engineer in the regular employ of Munn-Reese. The stored spectrum data gathered by the analyzer has been processed and displayed in this report as Figure A, Figure B and Figure C. In addition, spurious emission and harmonic measurements made using a calibrated FM antenna are included in FM Harmonic Measurements Table A. The spectrum analyzer and antenna were located in an unobstructed clearing within 0.25 km of the transmitting antenna.

### **Equipment Employed**

Anritsu MS2721B, Spectrum Master. Technical specifications of the Anritsu MS2721B are available on the Internet at [www.anritsu.com](http://www.anritsu.com).

Anritsu MP635A, Log-Periodic Antenna. The calibration curve was factory installed into the Spectrum Master. Technical specifications of the Anritsu MP635A are available on the Internet at [www.anritsu.com](http://www.anritsu.com).

## **EXHIBITS**

**Figure A** - Plot of Occupied Spectrum using a Span of 50 kHz/division

**Figure B** - Plot of Occupied Spectrum using a span of 200 kHz/division

**Figure C** - Plot of Measured Occupied Bandwidth, 99% Carrier Method.

The Figure A measurement and mask is the top part of the Figure B measurement mask expanded. Note that with the same modulation the carrier clears the corners of the Figure A measurement but failed on the Figure B measurement and mask. The expanded display allows the analyzer to produce a more accurate representation of the carrier under modulation. The Figure B measurement and mask is primarily for spurious emissions out to 1 MHz removed from the carrier. The resolution of the analyzer comes into play here. Many stations running high average modulation hit the top inside edges of the Figure B mask. Almost all stations running IBOC hit or exceed the top edges of the Figure B mask.

Figure C is the Spectrum Analyzer performing an Occupied Bandwidth measurement using the standard 99% of carrier energy method. The measurement is peak averaged over a “period of time” and represents the peak average modulation of the station with typical program material.

The conversion of Peak Average Occupied Bandwidth to percentage of peak modulation based on 75 kHz deviation equal to 100% modulation is as follows:

$$(\text{Measured Occupied Bandwidth in kHz}) \div 2 \div (75 \text{ kHz}) \times 100 = \% \text{ of Modulation}$$

From Figure C:

W227DO has a Measured Occupied Bandwidth of 148.820 KHz.


The Conversion to modulation level indicates 99.21 % Peak FM Modulation.

Harmonic measurements up to the fourth harmonic were measured using the Anritsu 2721B and the calibrated MP635A antenna. The Spectrum Master was setup and calibrated in accordance with the manufacturer's instructions, and the readings taken on the fundamental carrier frequency and up to the fourth harmonic. The following table lists the FM Harmonic data:

FM Harmonic Measurements							
<b>Main Carrier Frequency:</b>		93.3	MHz				
<b>ERP in Watts:</b>		125	Watts				
<b>Required Attenuation of harmonics:</b>		-62.0	dB				
<b>Main Carrier Level:</b>		153	mV				
		Frequency					
		MHz.	Level	Attenuation		Flag	
<b>2nd Harmonic:</b>	186.6	12	uV	-82.11	dB	Passed	
<b>3rd Harmonic:</b>	279.9	14	uV	-80.77	dB	Passed	
<b>4th Harmonic:</b>	373.2	10	uV	-83.69	dB	Passed	

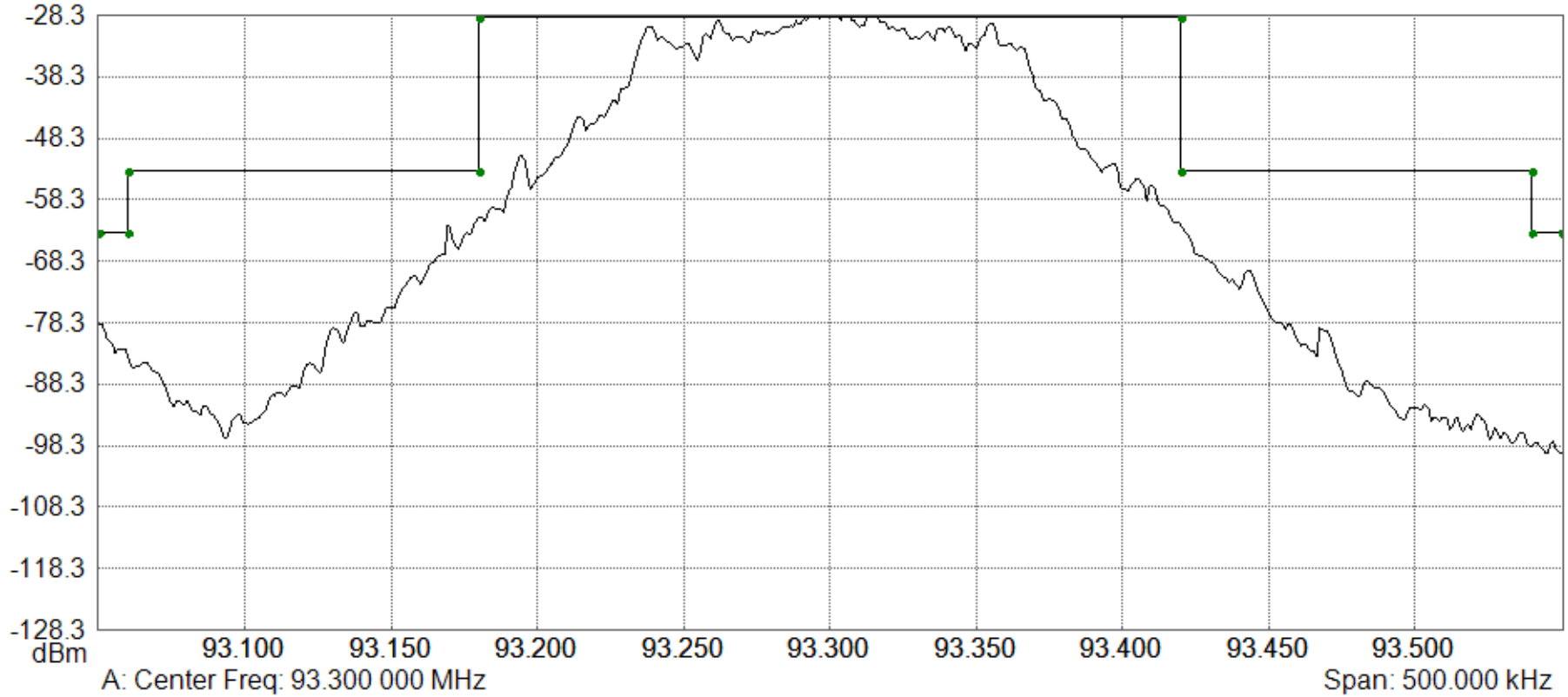
This report has been prepared by properly trained electronics specialists under the direction of the undersigned whose qualifications are a matter of record before the Federal Communications Commission. I declare under penalty of laws of perjury that the contents of this report are true and accurate to the best of my knowledge and belief.

July 26, 2022

By   
 Edmond R. Trombley, Senior Engineer

Spectrum Analyzer Data  
W227DO-FX-A (7/20/2022 12:08:34 PM)

Spectrum Analyzer

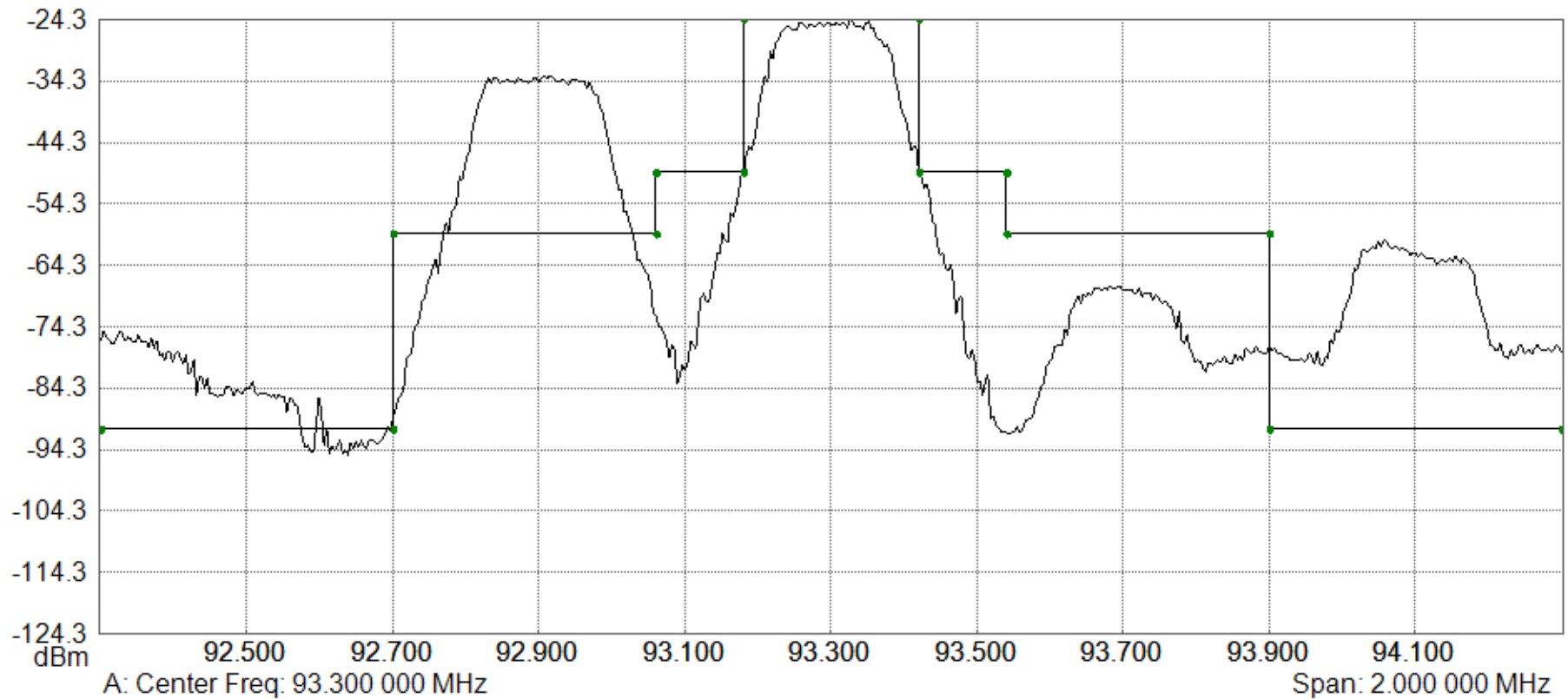


Trace A data:	Input Attenuation = 0.0 dB	Start Frequency = 93.050 000 MHz
Trace Mode = Max Hold	RBW = 3.0 kHz	Stop Frequency = 93.550 000 MHz
Preamp = OFF	VBW = 1.0 kHz	Frequency Span = 500.000 000 kHz
Min Sweep Time = 0.001 S	Detection = Peak	Reference Level = -28.300 dBm
Reference Level Offset = 0 dB	Center Frequency = 93.300 000 MHz	Scale = 10.0 dB/div

# Spectrum Analyzer Data

W227DO-FX-B (7/20/2022 12:04:42 PM)

Spectrum Analyzer



Trace A data:  
Trace Mode = Max Hold  
Preamp = OFF  
Min Sweep Time = 0.001 S  
Reference Level Offset = 0 dB

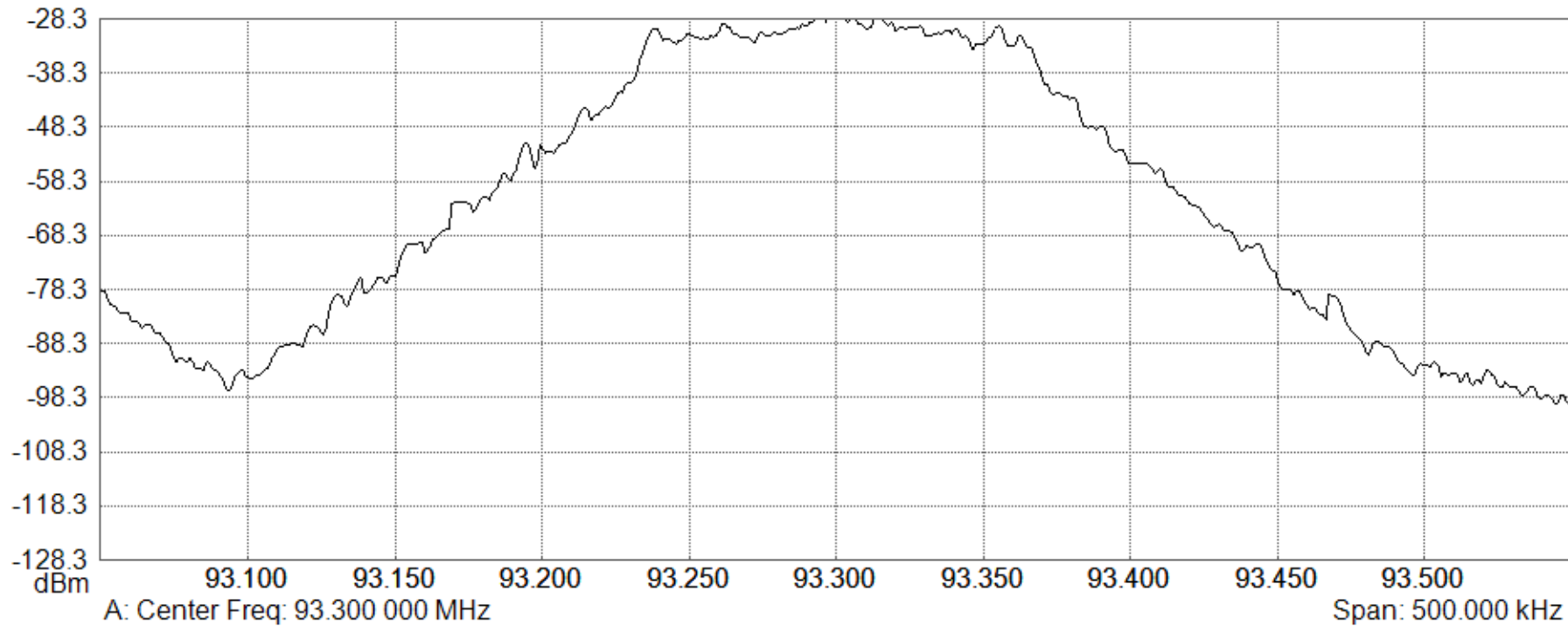
Input Attenuation = 0.0 dB  
RBW = 30.0 kHz  
VBW = 10.0 kHz  
Detection = Peak  
Center Frequency = 93.300 000 MHz

Start Frequency = 92.300 000 MHz  
Stop Frequency = 94.300 000 MHz  
Frequency Span = 2.000 000 MHz  
Reference Level = -24.300 dBm  
Scale = 10.0 dB/div

# Spectrum Analyzer Data

W227DO-FX-C (7/20/2022 12:09:55 PM)

Spectrum Analyzer



Occ BW % of Power

Percent: 99.00 %

Occ BW: 148.820 kHz

Measured XdB: 15.08 dB

Trace A data:

Trace Mode = Max Hold

Preamp = OFF

Min Sweep Time = 0.001 S

Reference Level Offset = 0 dB

Input Attenuation = 0.0 dB

RBW = 3.0 kHz

VBW = 1.0 kHz

Detection = Peak

Center Frequency = 93.300 000 MHz

Start Frequency = 93.050 000 MHz

Stop Frequency = 93.550 000 MHz

Frequency Span = 500.000 000 kHz

Reference Level = -28.300 dBm

Scale = 10.0 dB/div