

Engineering Report

Prepared by

iDSi

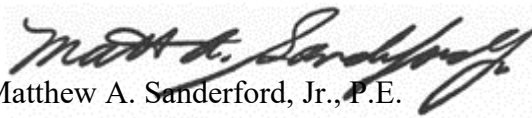
For

K242DE 96.3 MHz FM

Austin, Texas
Township Media, LLC
Spurious Emission Measurements

Date: May 3, 2022

Signature:


Matthew A. Sanderford, Jr., P.E.



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2. Certification

Matthew A. Sanderford, Jr., P.E., declares and states that he is a graduate Electrical Engineer with a Bachelor of Science in Electrical Engineering from the University of Texas at El Paso. He is a Licensed Professional Engineer in the State of Texas and Consulting Engineer in the employ of Intelligent Designs and Services, INC., a Registered Professional Corporation in the State of Texas, and that firm has been retained by **Township Media, LLC** to perform the measurements contained in this report.

All facts contained herein are true of his own knowledge except where stated to be on information or belief, and as to those facts, he believes them to be true.

I declare under penalty of perjury that the foregoing is true and correct.

Matthew A. Sanderford, Jr., P.E., CBPE
President
MARSAND, INC.

Executed on this **3rd day of May, 2022**



3. Project Report

3.1. Scope of Work

The purpose of the engineering services was to measure and provide proof that the spurious emissions requirements are met according to the FCC CP File Number 0000168099.

The Applicant's transmitter is connected to an FM 10 station combiner which is owned and operated by American Tower Corporation in Austin, Texas.

The CP contains a requirement stating: *"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 application for license."*

The above reference to the 73.317 FM transmission system requirements (Rules) is re-stated as follows:

(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.

(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.

(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.

Measurements were taken and recorded for each section, with and without Applicant's unmodulated carrier and all other stations operating under normal conditions, with modulated carriers.

3.2. Description of Work

Tuesday, 5-3-2022

A sweep was performed from the transmitter output to the filter/combiner input to ensure proper matching of the system using a network analyzer, Copper Mountain S5048, Sr. #14047029.



Figure 1 shows the sweep centered on 96.3 MHz (Applicant's frequency) and a 1 MHz span.

Figure 2 shows the sweep centered on 96.3 MHz and 200 kHz span. The match is properly made at 50 Ohms into the filter. The response reflects effects of the filter sidebands.

With all the stations operating at their full authorized power with modulated carriers, the Applicant's unmodulated carrier was turned off, then on at different span levels of +/- 250 kHz, +/- 600 kHz and +/- 2.5 MHz. A screen capture was taken at each measurement and examined, the carrier off display compared to the carrier on display for any indications of spurious emissions caused by the Applicant's 96.3 MHz carrier.

The spectrum analyzer used was a Rohde & Schwarz ETL, Sr. #100757.

The power probe to measure the input power to the filter/combiner was a Rohde & Schwarz NRP-Z21, Sr. #101762.

Figure 3 is the unmodulated carrier at 96.3 MHz showing the area +/- 240 KHz.

As shown in markers D2 (+120 kHz) and D3 (+240 kHz), any spurious emission is suppressed by more than -58 dB, referenced to carrier peak.

Figure 4 is the unmodulated carrier at 96.3 MHz showing the area +/- 240 kHz.

As shown at markers D2 (-120 kHz) and D4 (-240 kHz), any spurious emission is suppressed by more than -54 dB, referenced to carrier peak.

The Rules (b) above, specify spurious emissions to be below -25 dB. The Applicant exceeds the requirement, showing compliance with the Rules.

Figure 5 is the carrier at 96.3 MHz turned off +/- 600 kHz, markers at D3 (+240 kHz) and D2 (+600 kHz).

Figure 6 is the 96.3 MHz unmodulated carrier turned on, showing no noticeable additional noise compared to **Figure 5**, carrier removed, +240 kHz to +600 kHz.

Figure 7 is the carrier at 96.3 MHz turned off +/- 600 kHz, markers at D2 (-240 kHz) and D4 (-600 kHz).

Figure 8 is the 96.3 MHz unmodulated carrier turned on, showing no noticeable additional noise compared to **Figure 7**, carrier removed, -240 kHz to -600 kHz.

Since all the other stations were required to stay on the air during the measurements, the comparison of the Applicant's station for spurious at +/- 600 kHz, looking for any spurious energy added to the displayed span was the only way to confirm compliance with the Rules in (c) above. Between +240 kHz and +600 kHz, the span showed to be suppressed by -60 dB, well within the -35 dB requirements. Between -240 kHz and -600 kHz, the lower adjacent station, 95.9 MHz, is shown with modulation, covering the area under examination for spurious. Turning the Applicant's carrier off, then on, and carefully examining



the displays for any additional spurious energy when 96.3 MHz was turned on, showed that 96.3 MHz did not contribute any spurious emissions. The Applicant shows to be in compliance with the Rules.

Figure 9 is the 96.3 MHz unmodulated carrier turned off +/- 2.5 MHz, markers at D2 (+600 kHz and D4 (-600 kHz).

Figure 10 is the 96.3 MHz unmodulated carrier turned on, showing no noticeable additional noise compared to **Figure 9**, carrier removed, <-600 kHz and >+600 kHz. The displays were examined closely to try to identify any spurious emission between the 96.3 MHz unmodulated carrier on and off.

The Rules (d) specify attenuation of any spurious emission +/- 600 kHz to be $43 + 10 \log_{10}(\text{Power, in watts})$ dB or 80 dB, whichever is the lesser. The transmitter power applied for and used for this test is 250 W. The calculated limit is -66.98 dB, so -80 dB was used as the limit. The -80 dB could not be measured accurately due to the adjacent station modulated carriers present. Comparing the displays with the 96.3 MHz unmodulated carrier off and then on, showed no indication of any spurious emissions present. The Applicant shows to be in compliance with the Rules.

Figure 11 is the measurement of the transmitter power at the input to the filter/combiner, using the calibrated directional coupler located at the combiner input.

Since the testing, the station has been operating under Test Authority from the Commission. The FM stations in the area have been contacted and there have been no interference reports to 96.3 MHz while on the air. There are no known interference by spurious emissions and the Applicant believes the measurements show full compliance with the Rules and CP.



4. Exhibits

4.1. 96.3 MHz 1 MHz Span into filter

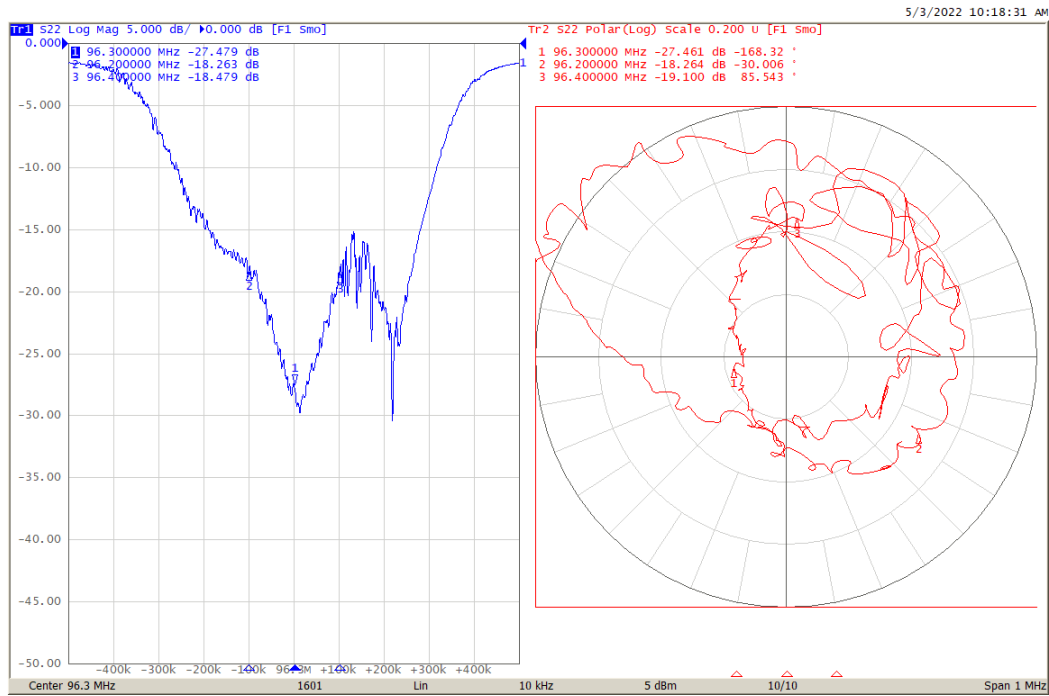


Figure 1 – 96.3 MHz 1 MHz Span into filter



4.2. 96.3 MHz 200 kHz Span into filter

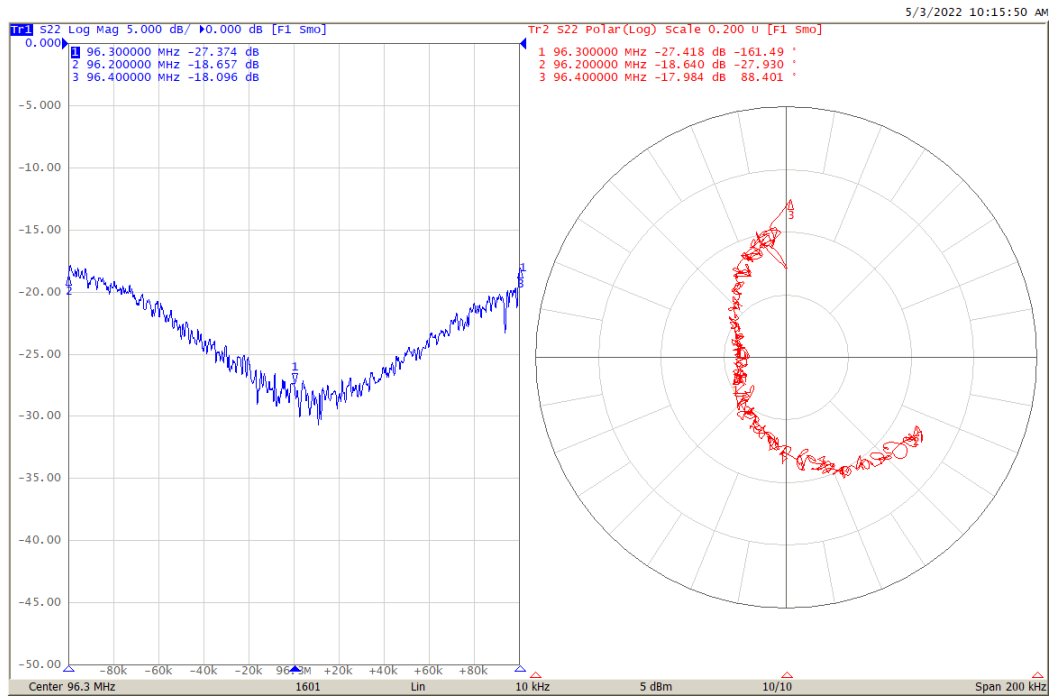


Figure 2 - 96.3 MHz 200 kHz Span into filter



4.3. 96.3 MHz +120 kHz to +240 kHz

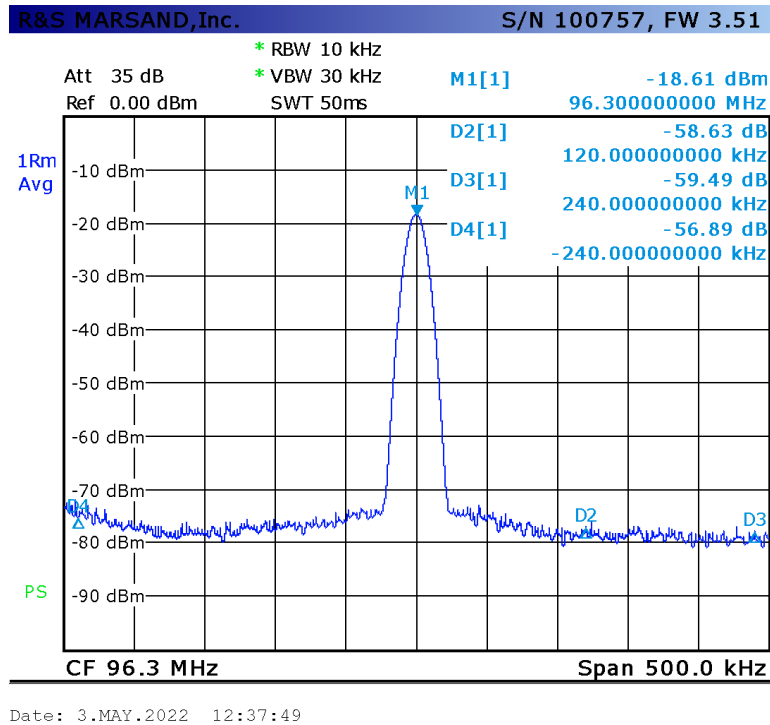


Figure 3 - 96.3 MHz +120 kHz to +240 kHz



4.4. 96.3 MHz -120 kHz to -240 kHz

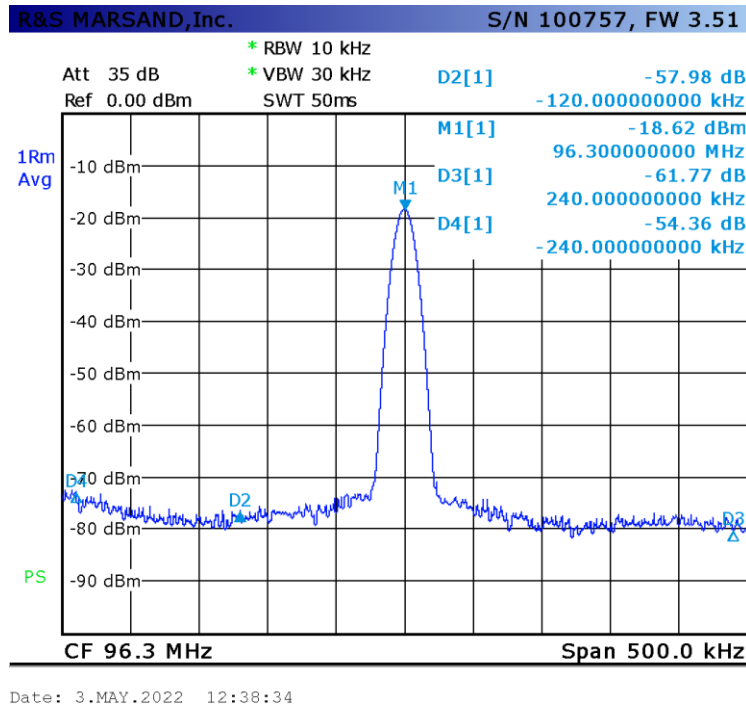


Figure 4 - 96.3 MHz -120 kHz to -240 kHz



4.5. 96.3 MHz Carrier Off +240 to +600 kHz

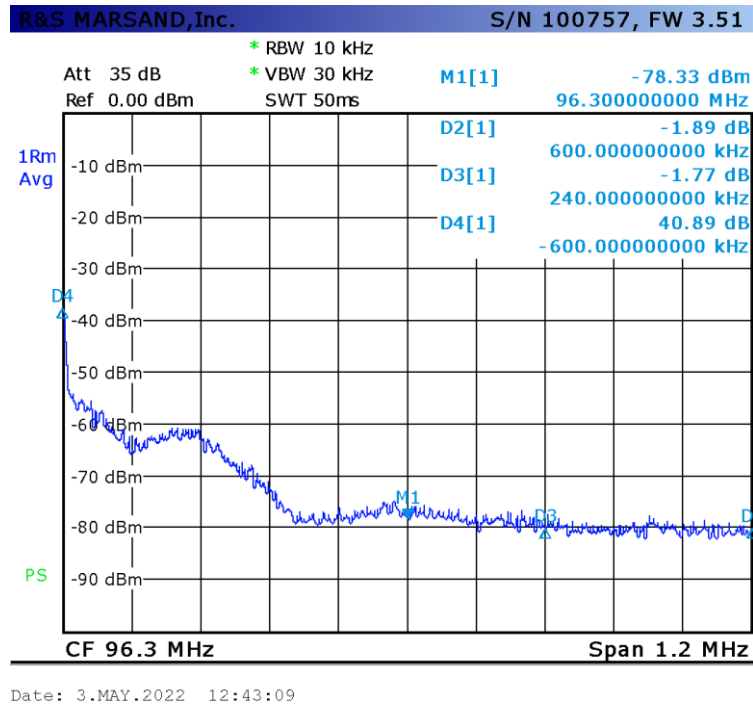


Figure 5 - 96.3 MHz Carrier Off +240 to +600 kHz



4.6. 96.3 MHz Carrier on, +240 kHz to +600 kHz

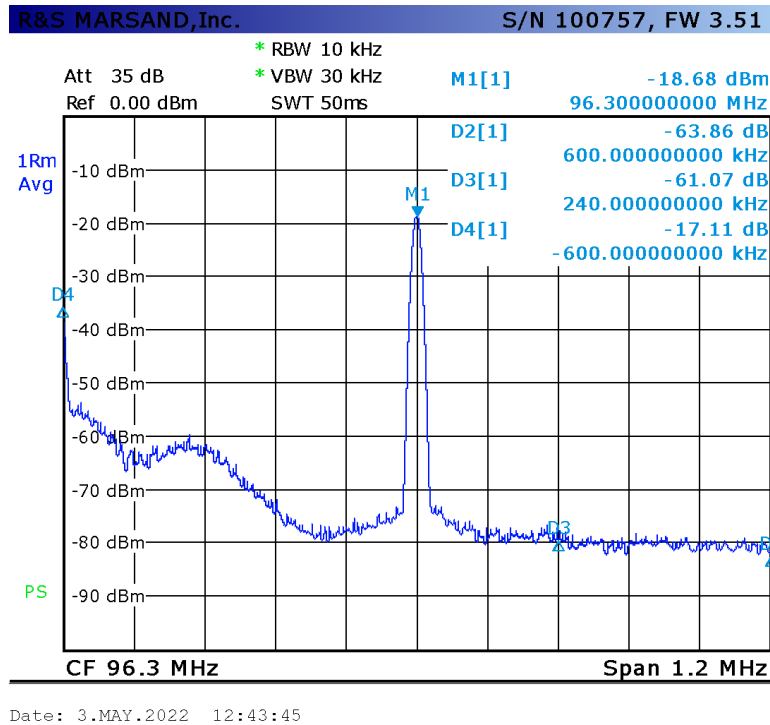


Figure 6 - 96.3 MHz Carrier on, +240 kHz to +600 kHz



4.7. 96.3 MHz Carrier Off -240 to -600 kHz

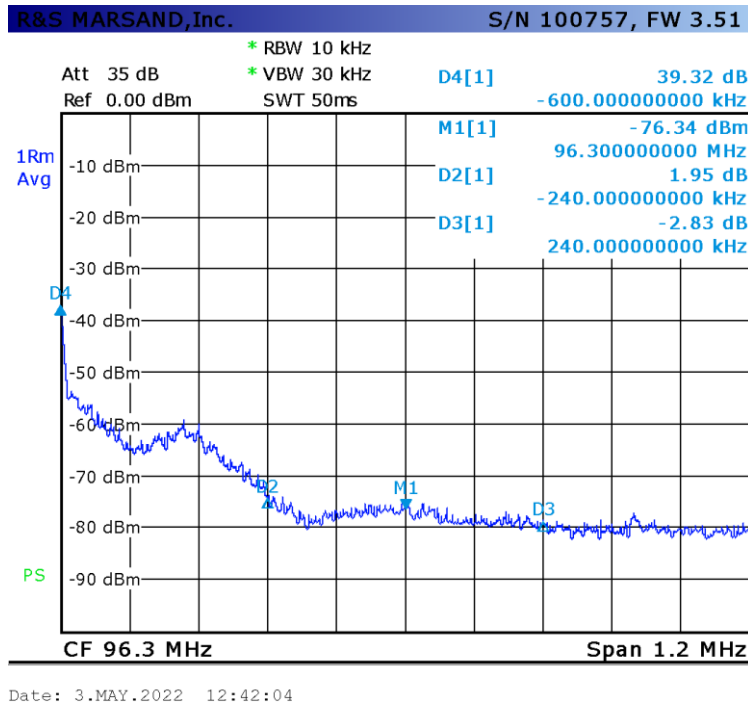


Figure 7 - 96.3 MHz Carrier Off -240 to -600 kHz



4.8. 96.3 Mhz Carrier on, -240 kHz to -600 kHz

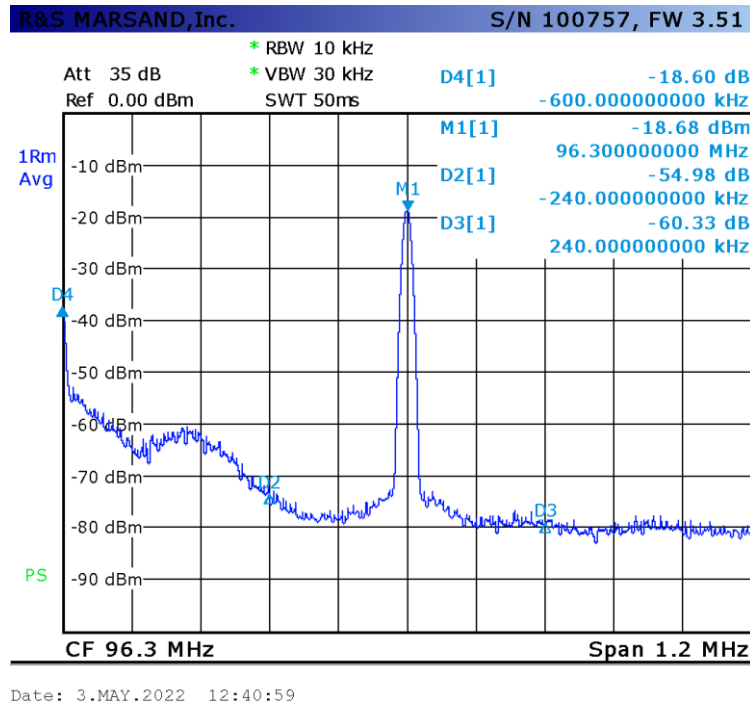


Figure 8 - 96.3 MHz Carrier on, -240 kHz to -600 kHz



4.9. 96.3 MHz, Carrier off, +600 kHz to +2.5 MHz

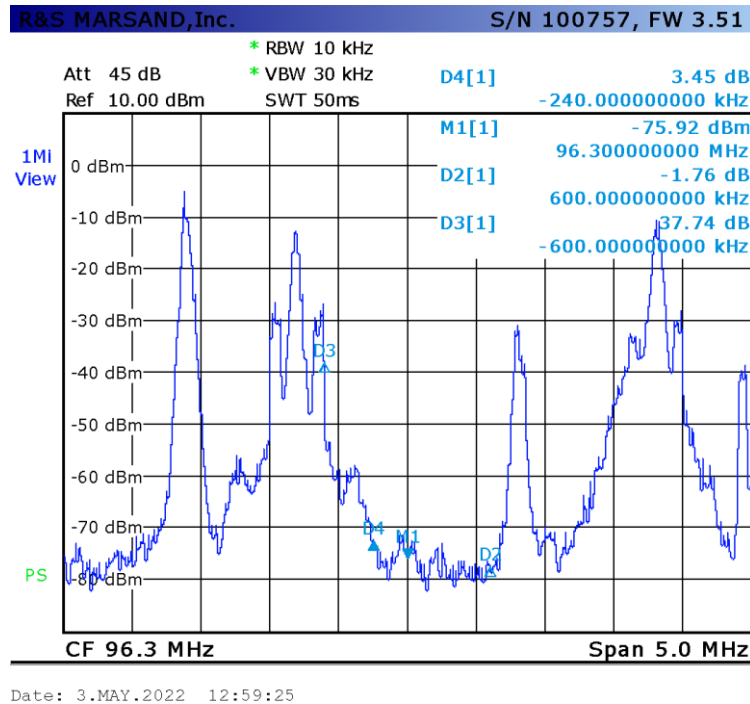


Figure 9 - 96.3 MHz, Carrier off, +600 kHz to +2.5 MHz



4.10. 96.3 MHz, Carrier on, -600 kHz to -2.5 MHz

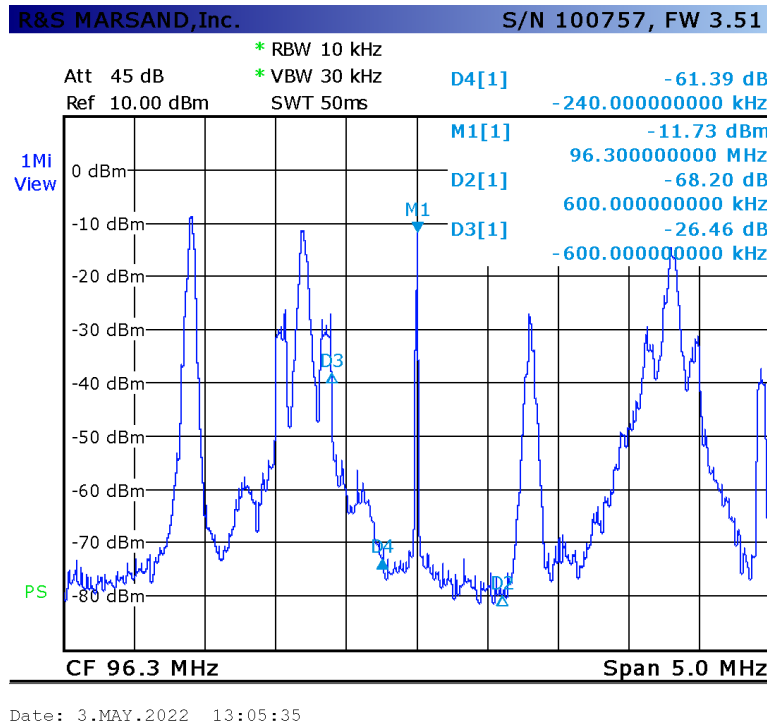


Figure 10 - 96.3 MHz, Carrier on, -600 kHz to -2.5 MHz

4.11. 96.3 MHz Power measured at filter/combiner input

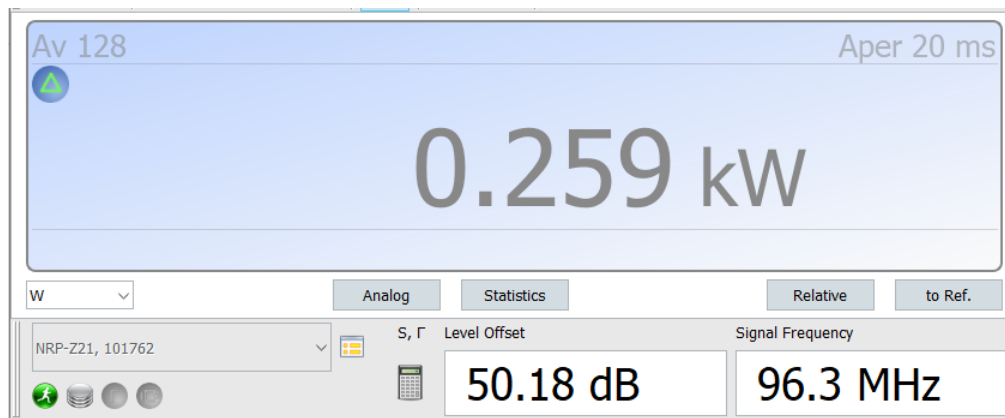


Figure 11 - 96.3 MHz Power measured at filter/combiner input