

Testing A New Amplifier For Affordable Radio Astronomy

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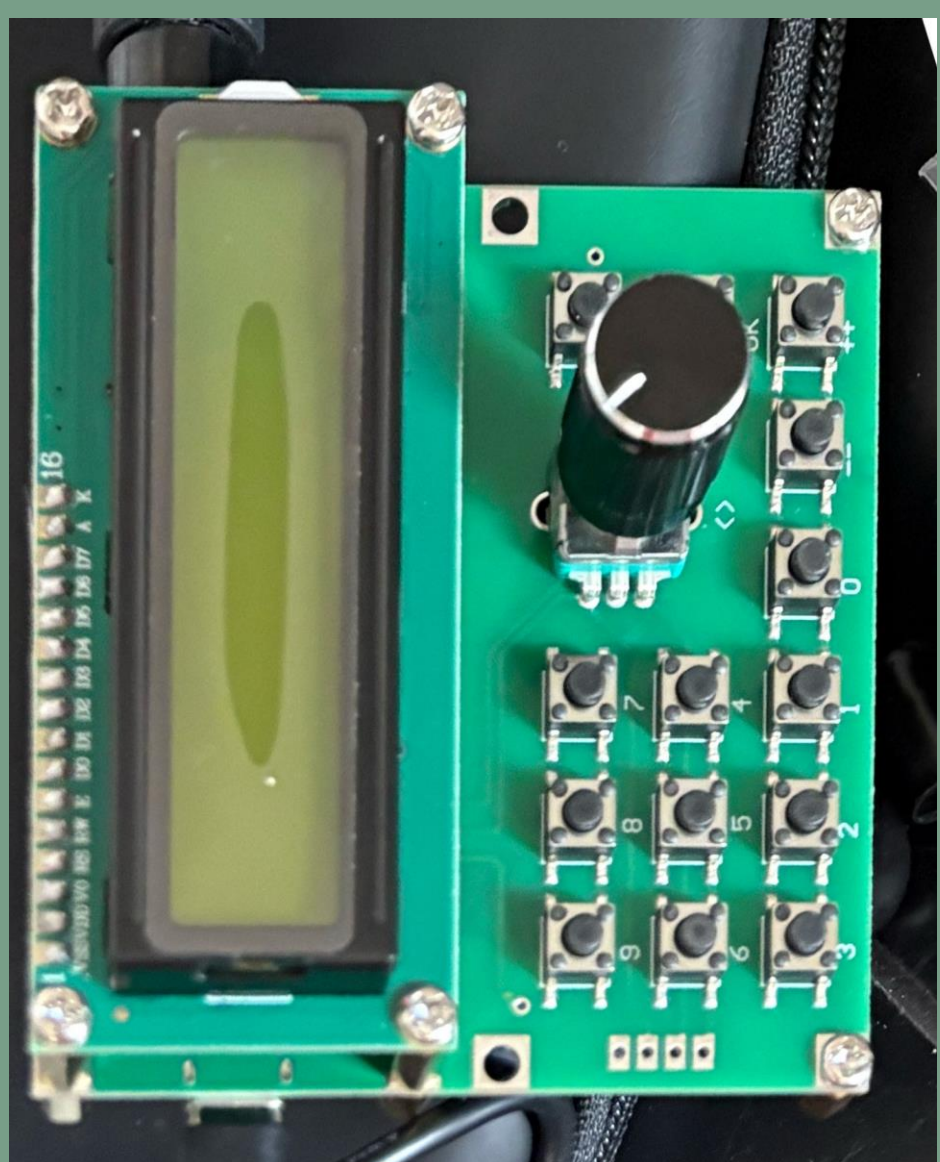
Abstract

We started this project for building affordable radio astronomy equipment for people to experiment in a professional way. The same equipment and techniques are used in real-world systems, including wireless communication, radar, and satellite technology. We built a system, which was simple and efficient, but the amplifier we selected NOOELEC SAWbird+ H1 Barebone was no longer produced. Now we are testing out a new amplifier Nooelec SAWbird+ H1 to compare the performance to the old. The gain of the amplifier and bandpass of the filter was comparable to the original device. Next, we are testing for external interference with a handheld RF signal generator. This experiment is important because it provided evidence on how new amplifiers work compared to the old ones, supporting future students and hobbyists.

Introduction

In recent years, there has been a push to create new technology that is of professional level that is inexpensive and accessible to hobbyists. Through experimentation with different equipment and circuits, we were able to access the performance level a radio frequency generator. This research focuses specifically on how two different RF amplifiers, NOOELEC SAWbird+ H1 Barebone and Nooelec SAWbird+ H1, different antennas, and different configuration of circuits affect the signals produced by the RF generator. .

Test equipment



New RF Generator



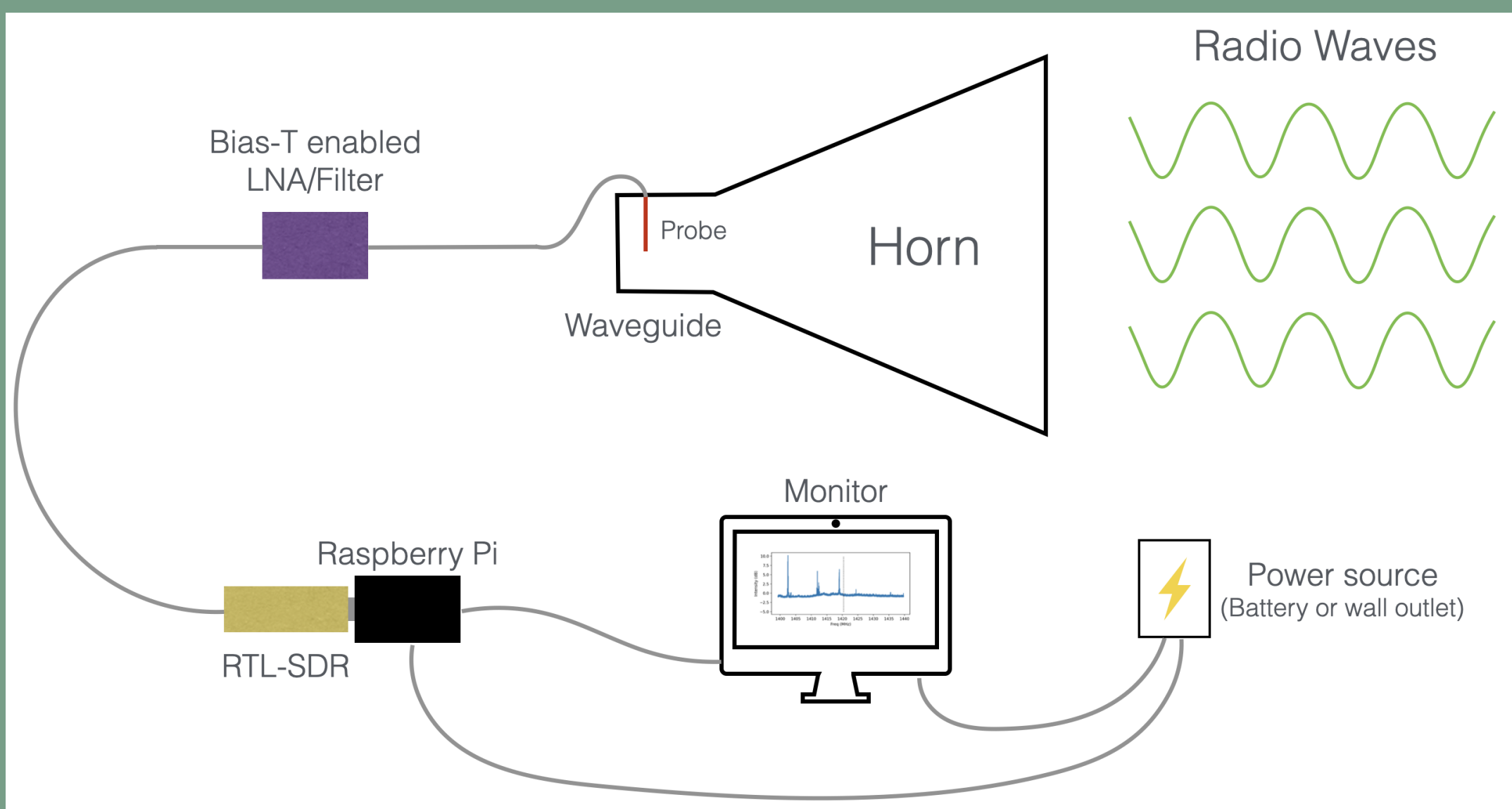
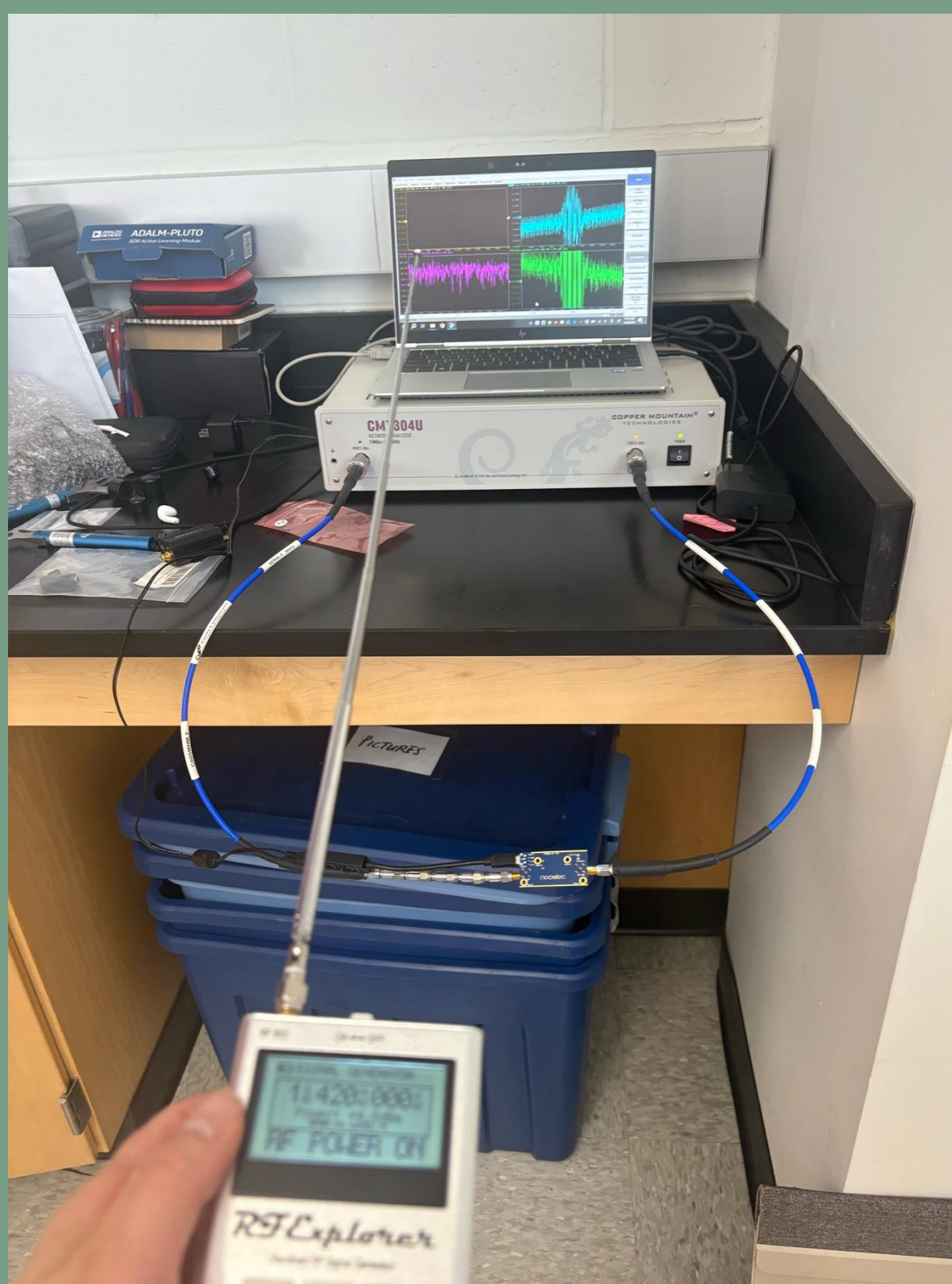
Old RF Generator



New Amplifier



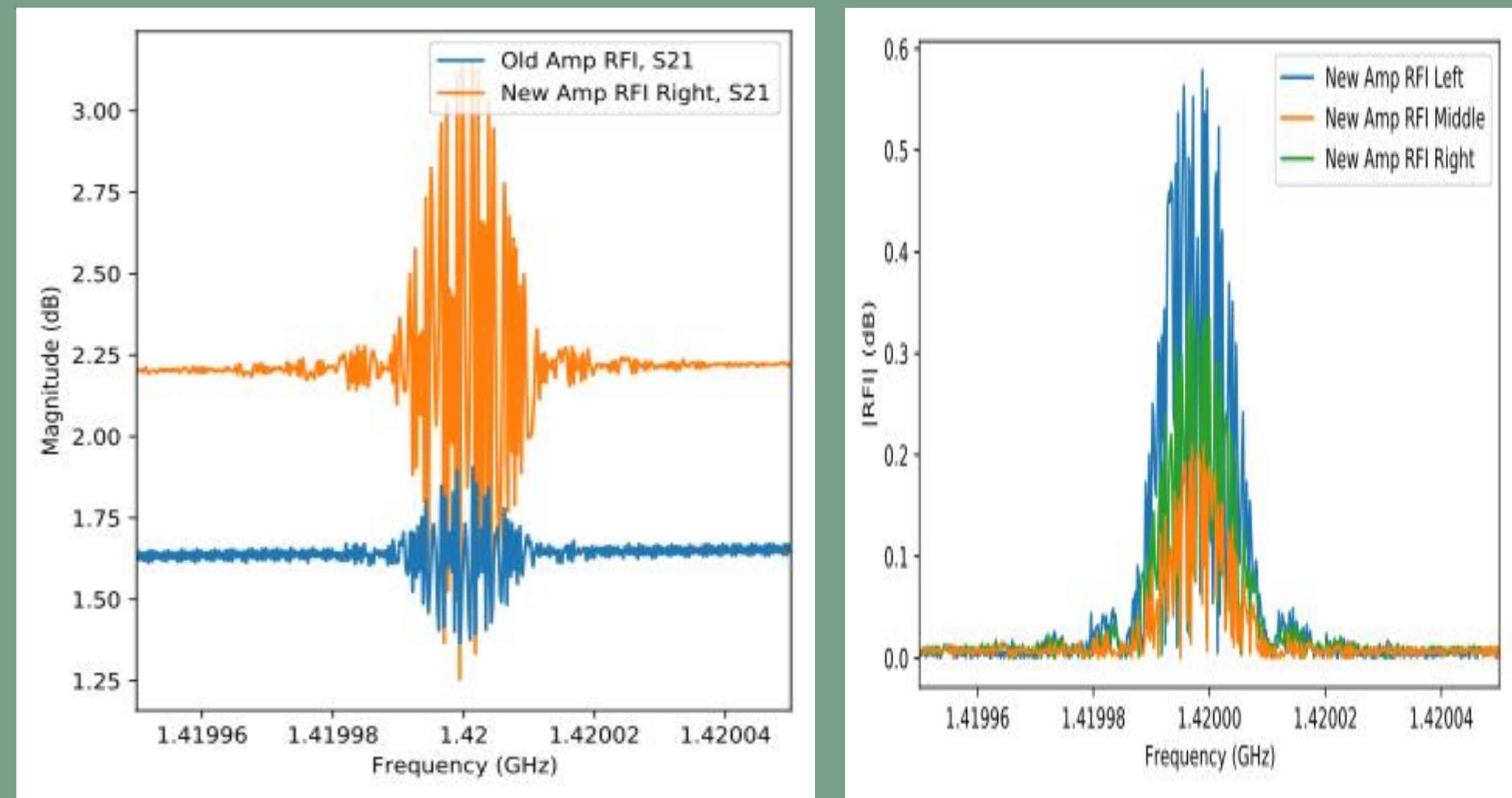
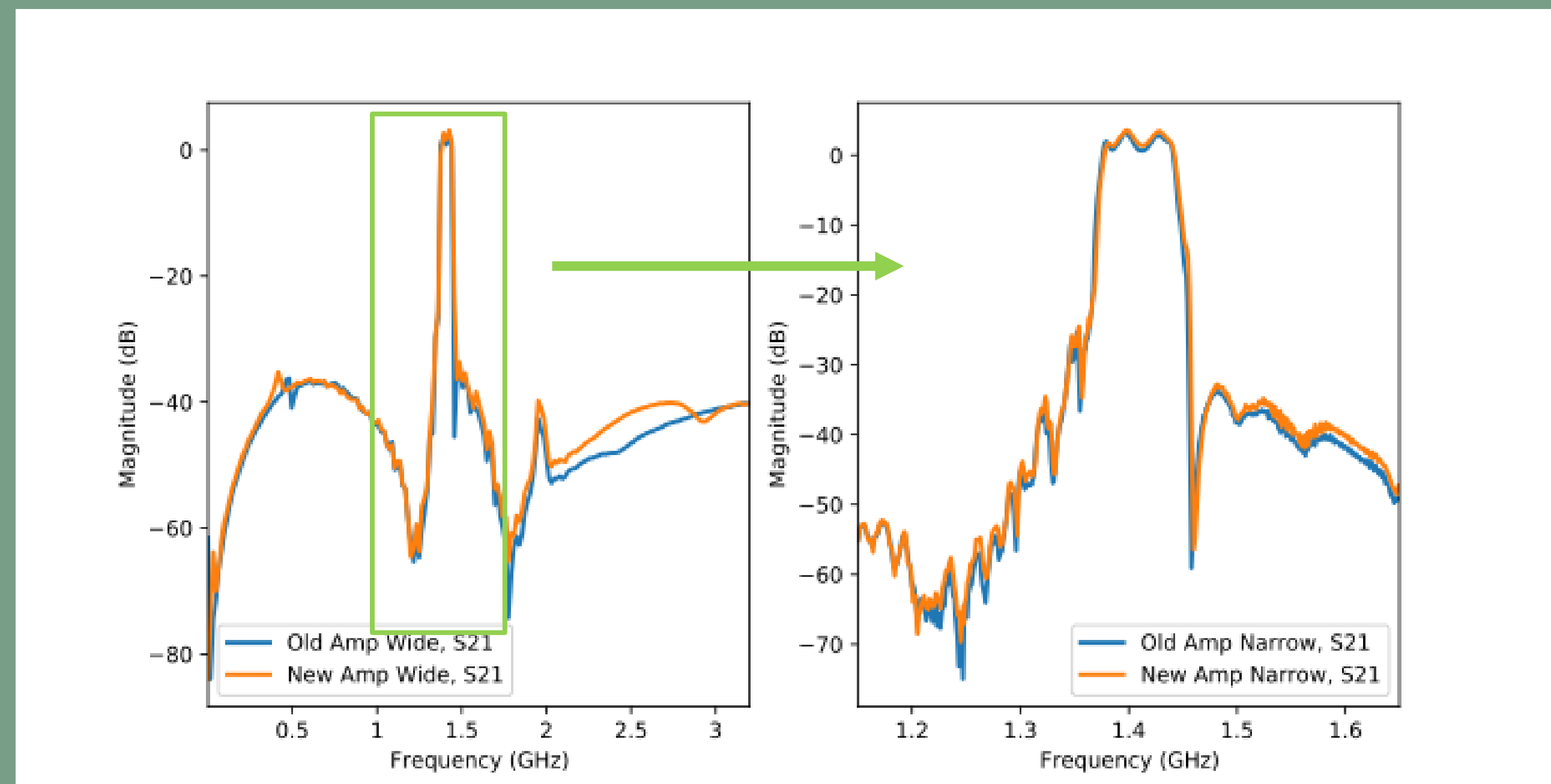
Old Amplifier



Methods

Step 1, Connect computer to Vector Network Analyzer, Then connect to old Amplifier. The signal from 1 to 2 (S21) which is showing on the left pictures. Step 2, Switch to New Amplifier. The screen didn't show much difference than old Amplifier. And then we added old RF generator. Before we zoomed in, the screen didn't show much difference. After we zoom in, we saw the wave. We took pictures, screenshot and saved the data. Then we use the new RF generator, which produced much more effect than the old RF generator. I was curious about the result, so I put the new antenna on the old RF generator, and found it was a bigger wave. This shows the antenna make the significant change more than the RF Generator in this lab. In the end our interference tests were done using the old RF generator and the new antenna. We compared the two amplifiers and looked at placement of interference on the new amplifier.

Results



Conclusion

The filtering and amplification of the new amplifier was comparable to the old amplifier. We also found that the old amplifier is less affected than new amplifier when interference is introduced. However, the experiment reveals that system performance is highly dependent on external components, particularly the antenna. We were able to successfully show that the different antennae had the most effect on the RF signals. Also, where the antenna positioned make the different interference. Outside the amplifier box is the smallest effect, left by the input is strongest effected.

Literature Cited

<https://astrochart.github.io/>