

Planning Ahead

- Plan where you want to look for data – take into consideration day, time, and location
- Make sure the battery is charged

Packing List*

Essentials:

- Horn
- Nooelec amp + filter
- RTL-SDR • SMA cable
- Pi + Mouse
- Monitor + HDMI cable
- Battery
- USB C cable
- USB 2.0 micro B cable
- Tape, aluminum tape, foil
- Notebook, pen
- Phone

If Needed and Available:

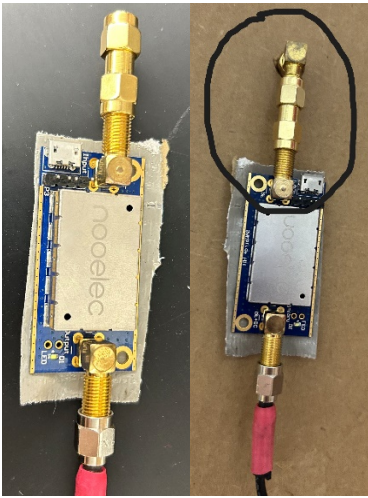
- RF explorer
- Table
- Garden stakes, lawn chair, and boxes for propping up horn
- Tarp (to stay dry on wet grass)

*For our build specifically, we used the Nooelec amp + filter and the raspberry pi 400

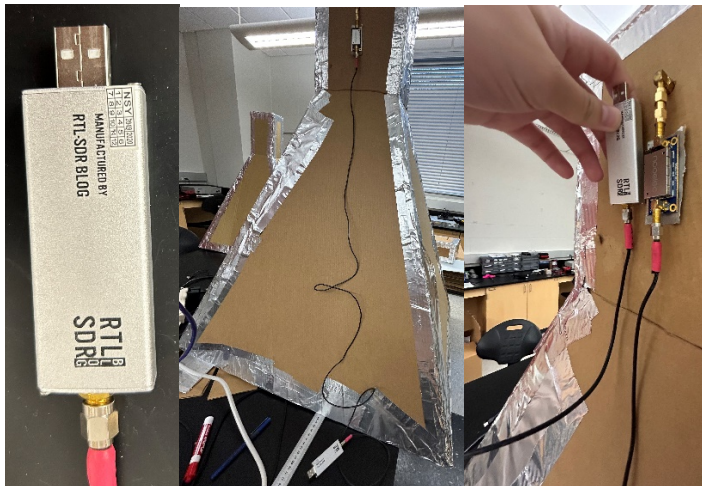
Taking the Data

Set Up Telescope and Equipment:

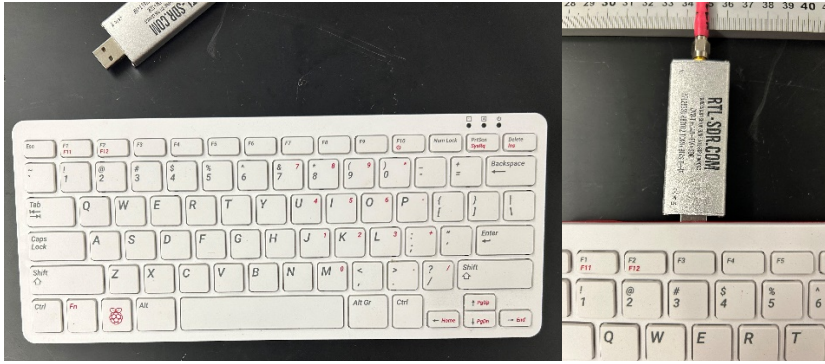
- Place telescope on ground
- Connect the nooelec amp and filter onto the horn by twisting the bolt



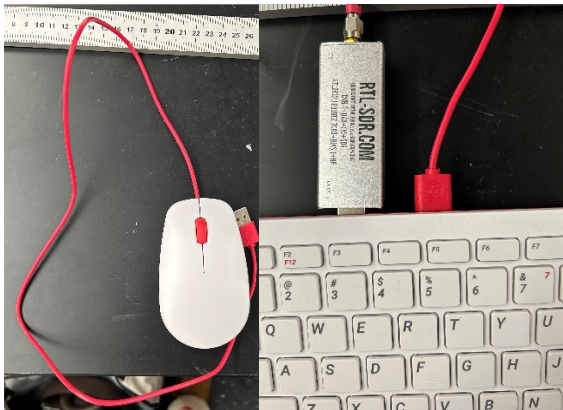
- Connect the nooelec amp and filter with the RTL-SDR using the SMA cable



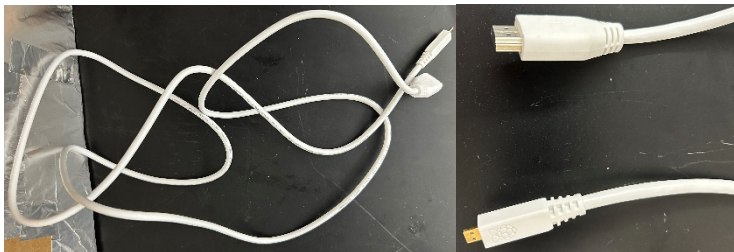
- Plug the RTL-SDR into the raspberry pi USB 2 port



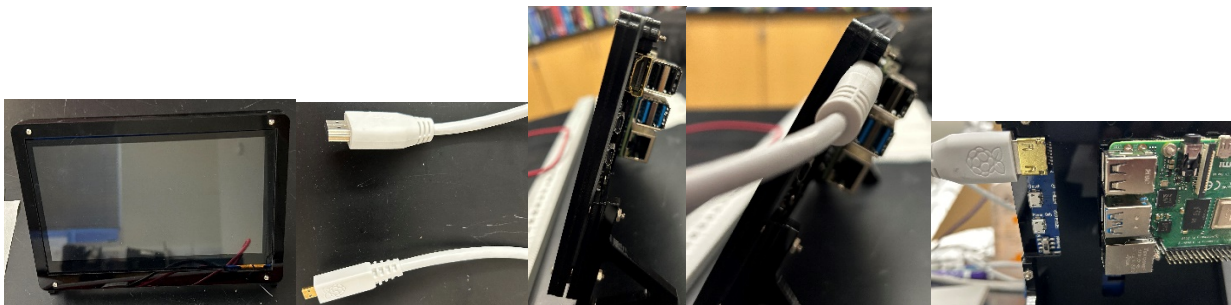
- Plug the mouse into the raspberry pi



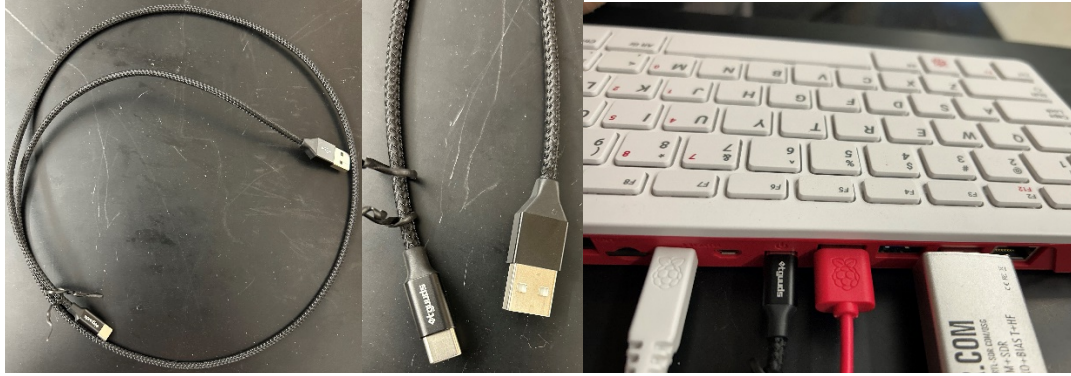
- Plug the small end of the HDMI cable into the raspberry pi



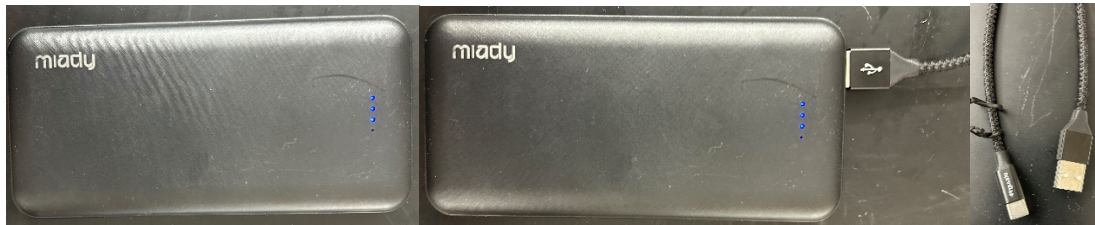
- Plug the large end of the HDMI cable into the monitor



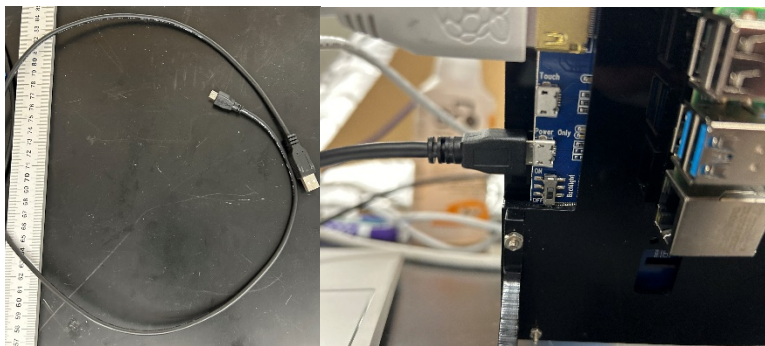
- Plug the small end of the USB C cable into the raspberry pi where the power symbol is



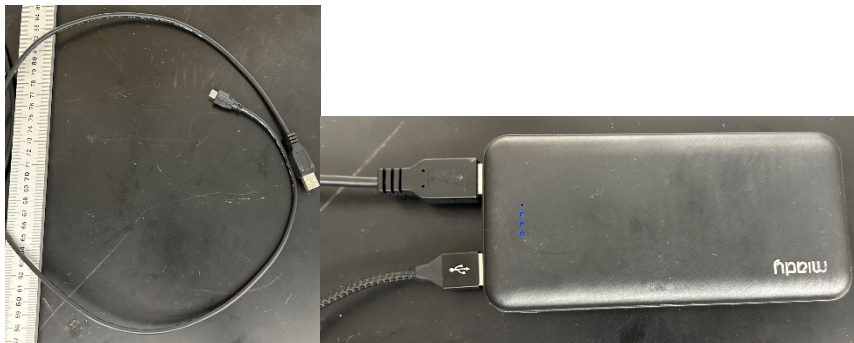
- Plug the large end of the USB C cable into the battery



- Plug the small end of the USB 2.0 micro B cable into the “power only” spot in the monitor



- Plug the large end of the USB 2.0 micro B cable into the battery



- Once everything is plugged in, the screen should light up



- Point towards desired quadrant or direction, use compass app on phone
- Set to desired angle, using props to make sure the telescope remains at the same angle
- Check angle with level app on phone
- Hold telescope throughout all the data collection

Set Up Software:

- Open CHART_GUI file on monitor
- Click execute terminal
- Enter the initial frequency and final frequency that you would like to collect for your data (parameters)
- Change the integration time for how many seconds you would like the horn to collect data for each integration
- Change the number of integrations so you collect enough data
- Enable Bias-T, only if you are powering your amp this way with the baseline design
- Write a short description of what you are pointed at, what you're looking at in the sky, and where you are specifically in your location
- Enter your username for Jupyter Hub
- Enter the general location you are taking the data from
- Enter the trial number, if it is the first trial at a specific location then begin with one otherwise if you are taking data from the same spot then change trial numbers as you go
- Enter the date using periods (.) between the month, day, and year
- Enter the current time you will begin taking data, note that the monitor does not usually display the correct time so it's important to not use the system date and time
- Press Start to begin collecting the data
- Check to make sure the light is on the amplifier and filter
- Make sure the CHART_GUI is collecting data by clicking on the terminal window that opens with the GUI. It should say "Frequency:" with your initial frequency stated after

- Once the code displays “Done”, all the data for that trial has been collected
- If you are collecting more data in the same place then switch the trial number and time, but if you are changing locations go back and make sure the information is updated for the next trial

Uploading the Data:

- Make sure you are connected to the internet
- Open Jupyter Hub and sign in
- Click the data folder
- Click upload
- Find and open the zip file you want to upload, make sure the file includes the correct location, date, trial number, and time
- Click Upload again next to the file in Jupyter Hub
- Repeat process until all the files you want are uploaded