

AAVN

Avian/Airborne Vehicle Notifier



Nolan Rapp



Finn Buggy



Stanley Guo



Hannya Yan



Michael Tang

The Problem

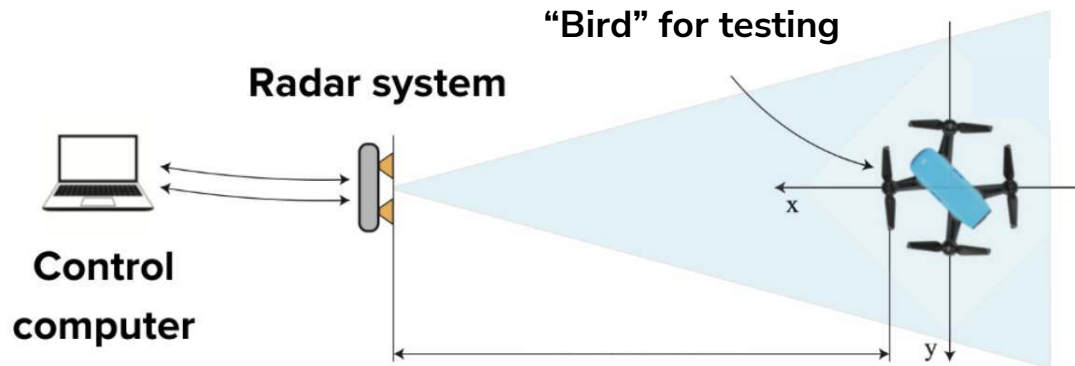
- Over 200,000 birds are killed every year by wind turbines
- Avian advocacy and government groups protest the construction of wind turbines on the behalf of the birds
- There are regulations requiring due diligence for wind farm operators



The Solution

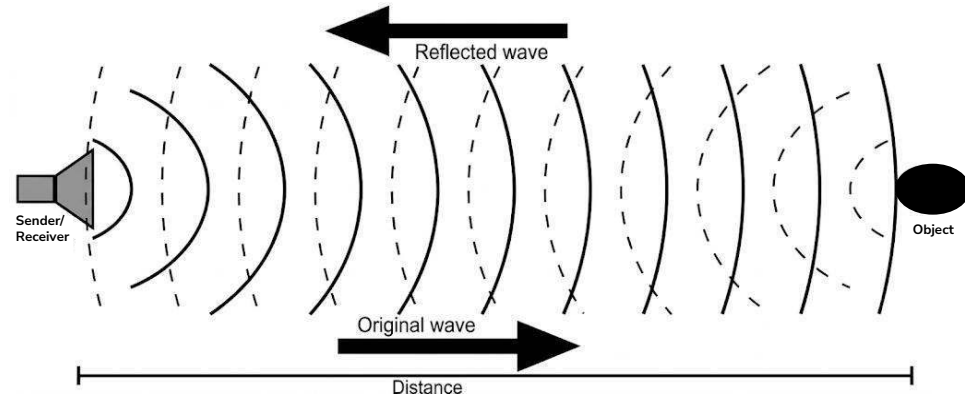
Sky Radar System

- Uses a low-power X-band radar for wide coverage and fine resolution
- FMCW radar provides target location and velocity
- Easy-to-use UI provides useable data



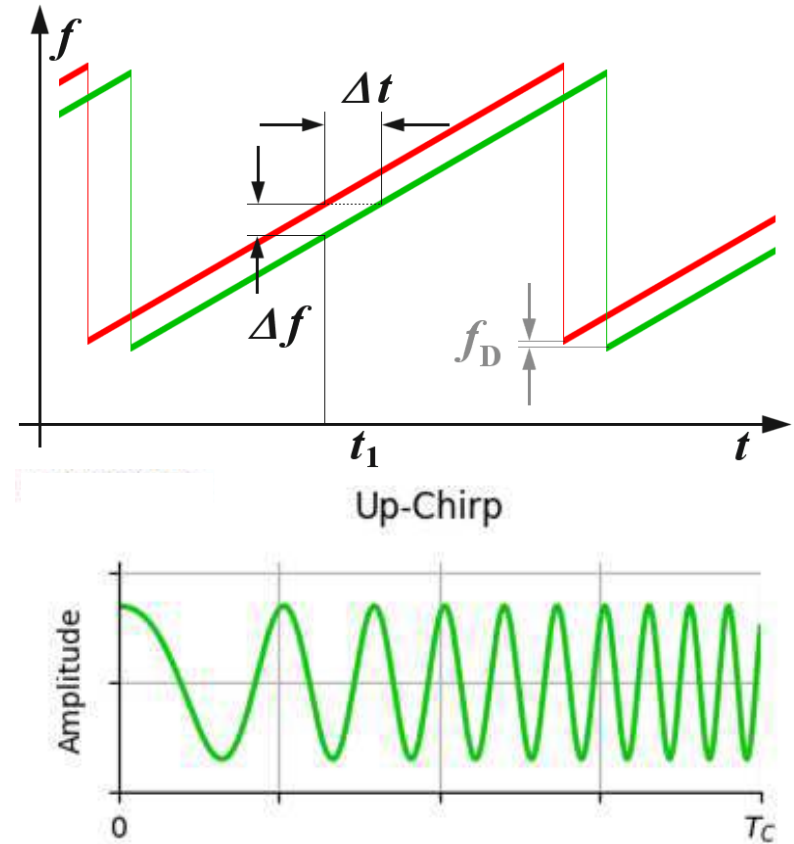
Continuous Wave

- Sending a constant signal raises the average power of the signal
- Easy to measure velocity, impossible to tell range
- For range, you must use frequency modulation

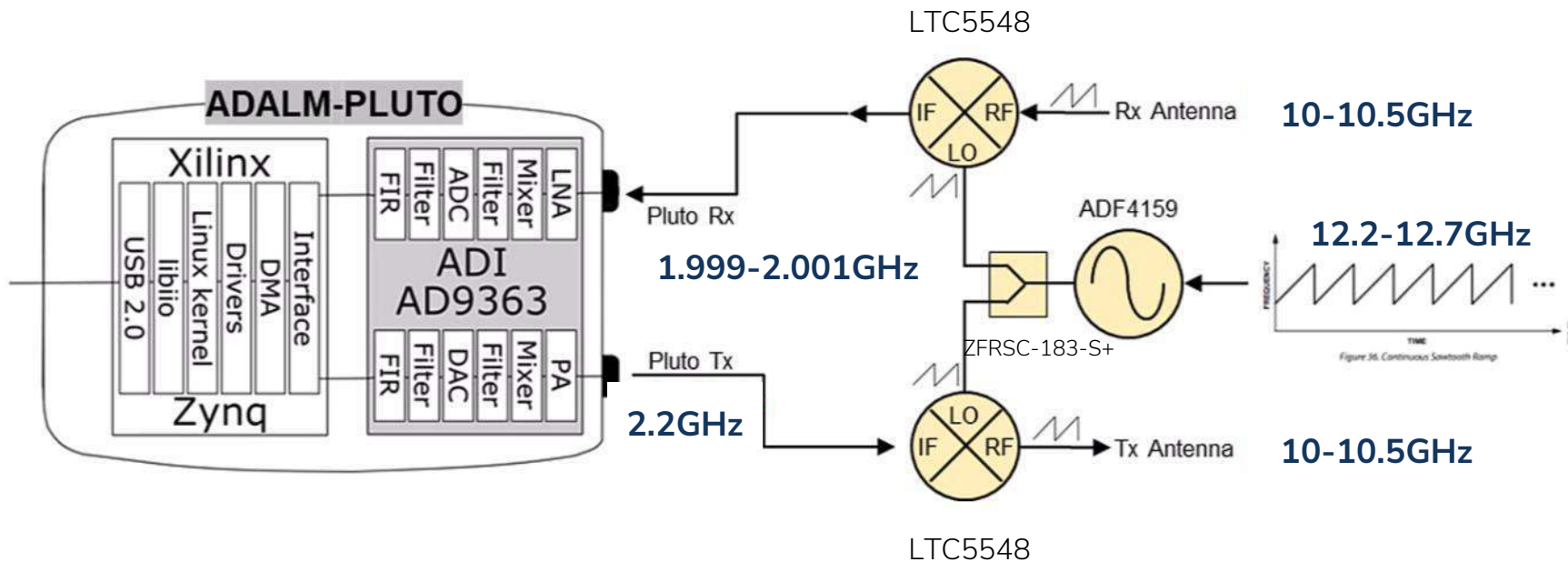


FMCW

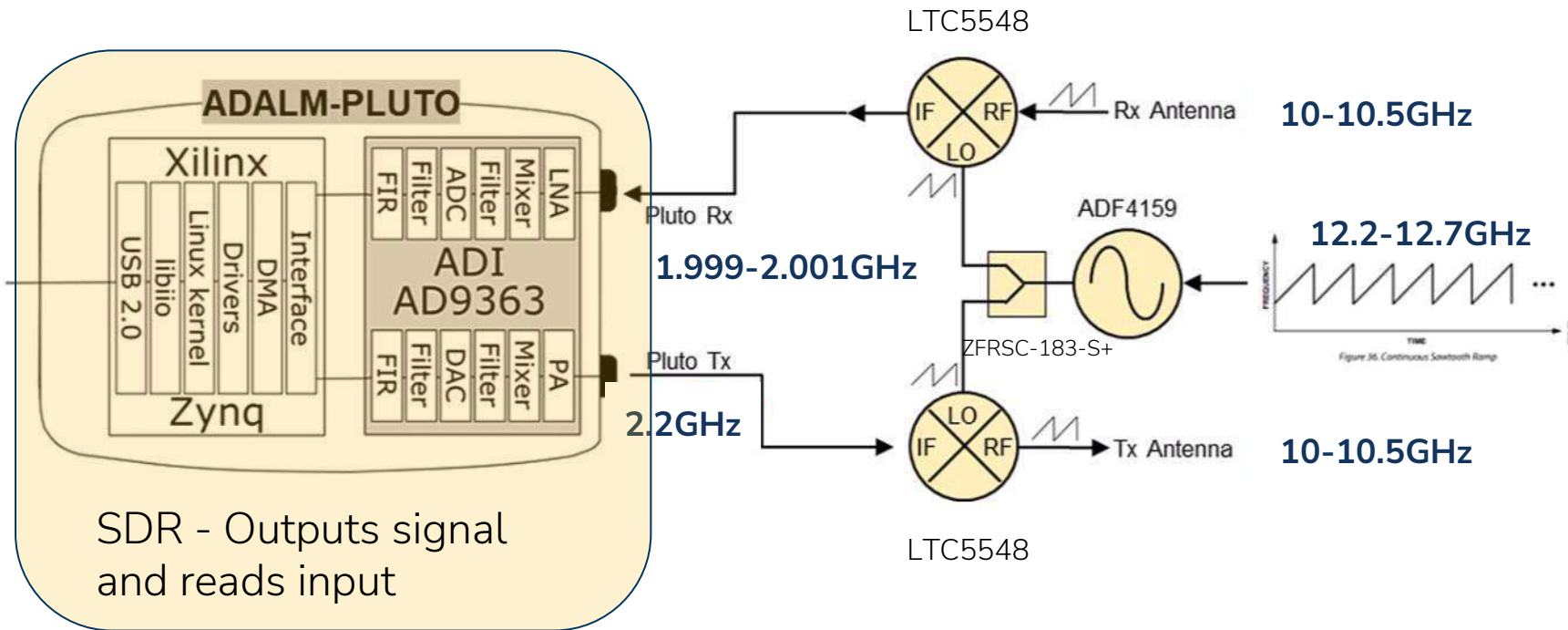
- Frequency Modulated Continuous Wave radar combines the benefits of both pulse radar and continuous wave radar
- By sending out chirps, range can be easily measured
- Because the radar is constantly transmitting, average power is high
- Easy to calculate velocity



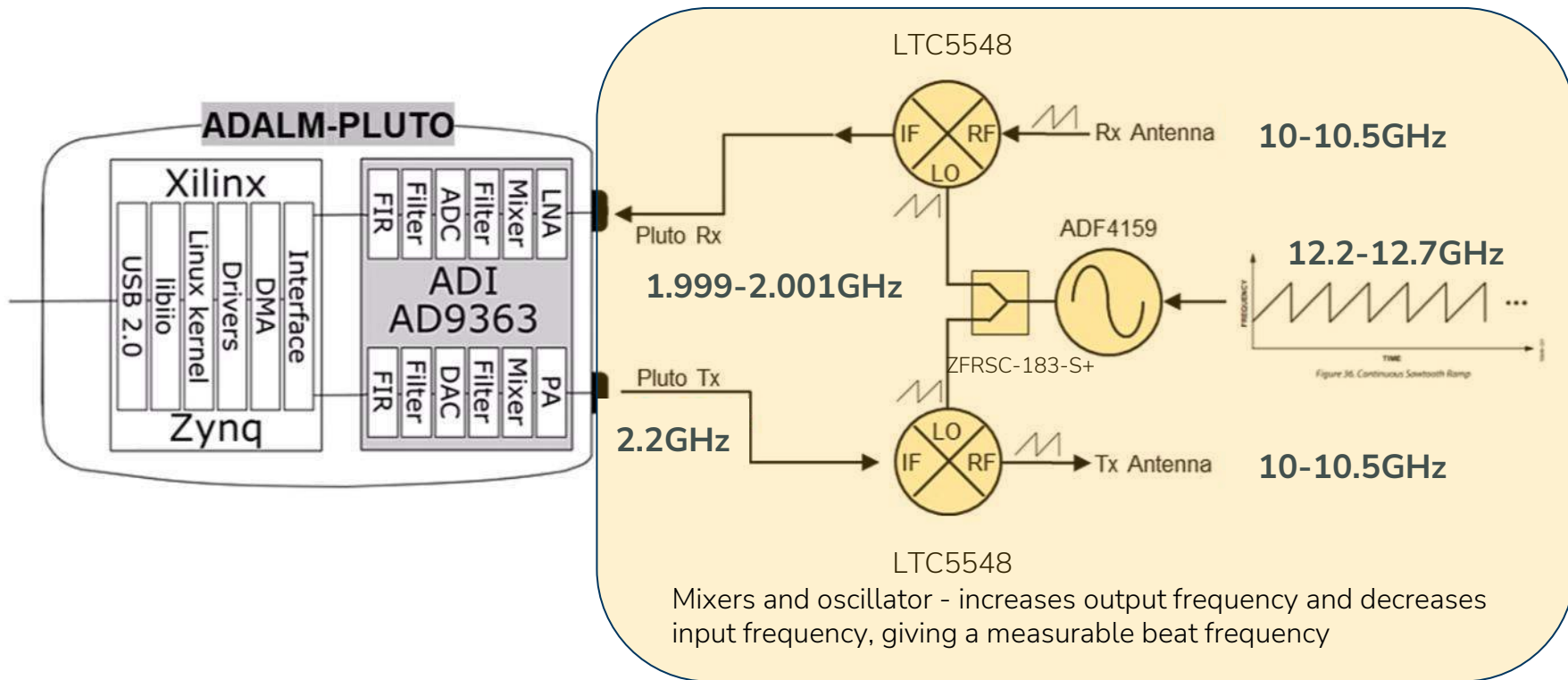
Block Diagram



Block Diagram

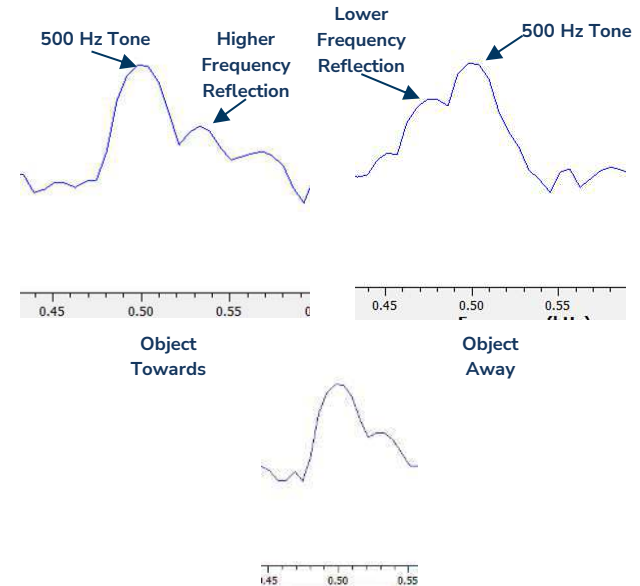
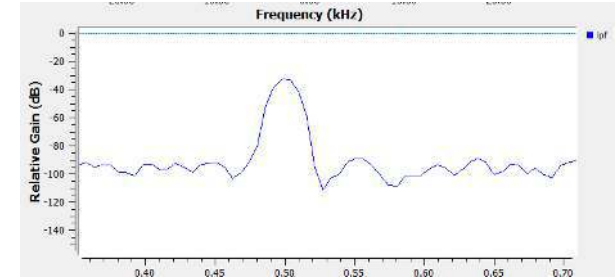


Block Diagram

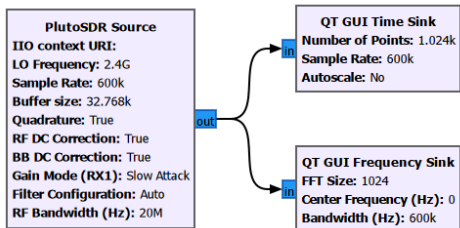


Doppler Processing

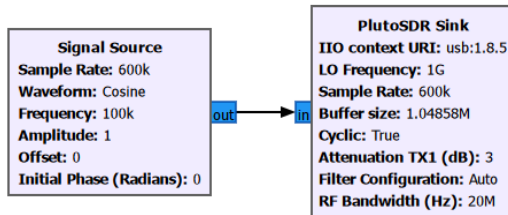
- Receive full spectrum
- Only care about small bandwidth
- Movements cause frequency deviations
 - Towards: high frequency bump
 - Away: low frequency bump
- Must filter leakage



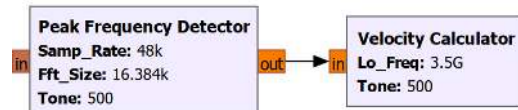
GNU Radio



GUI Sinks



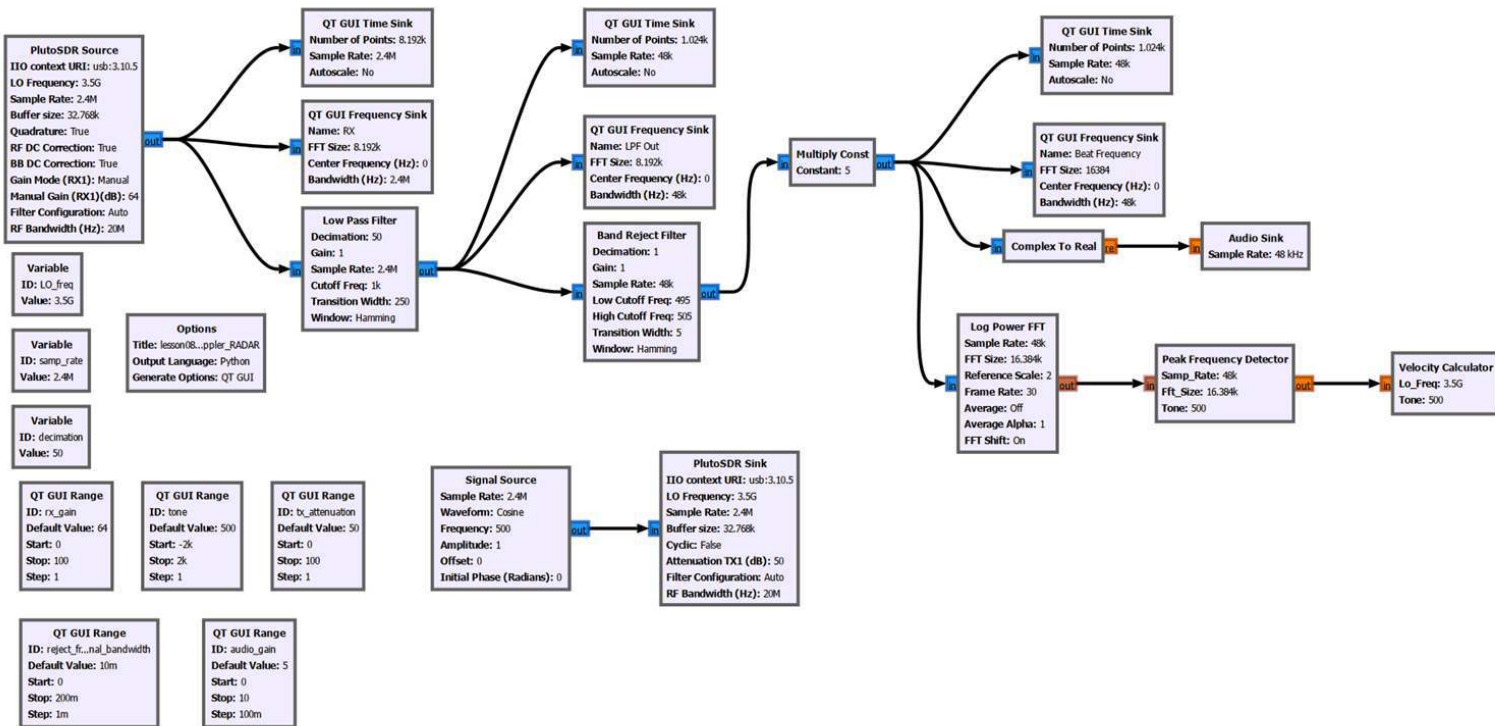
Signal Sources



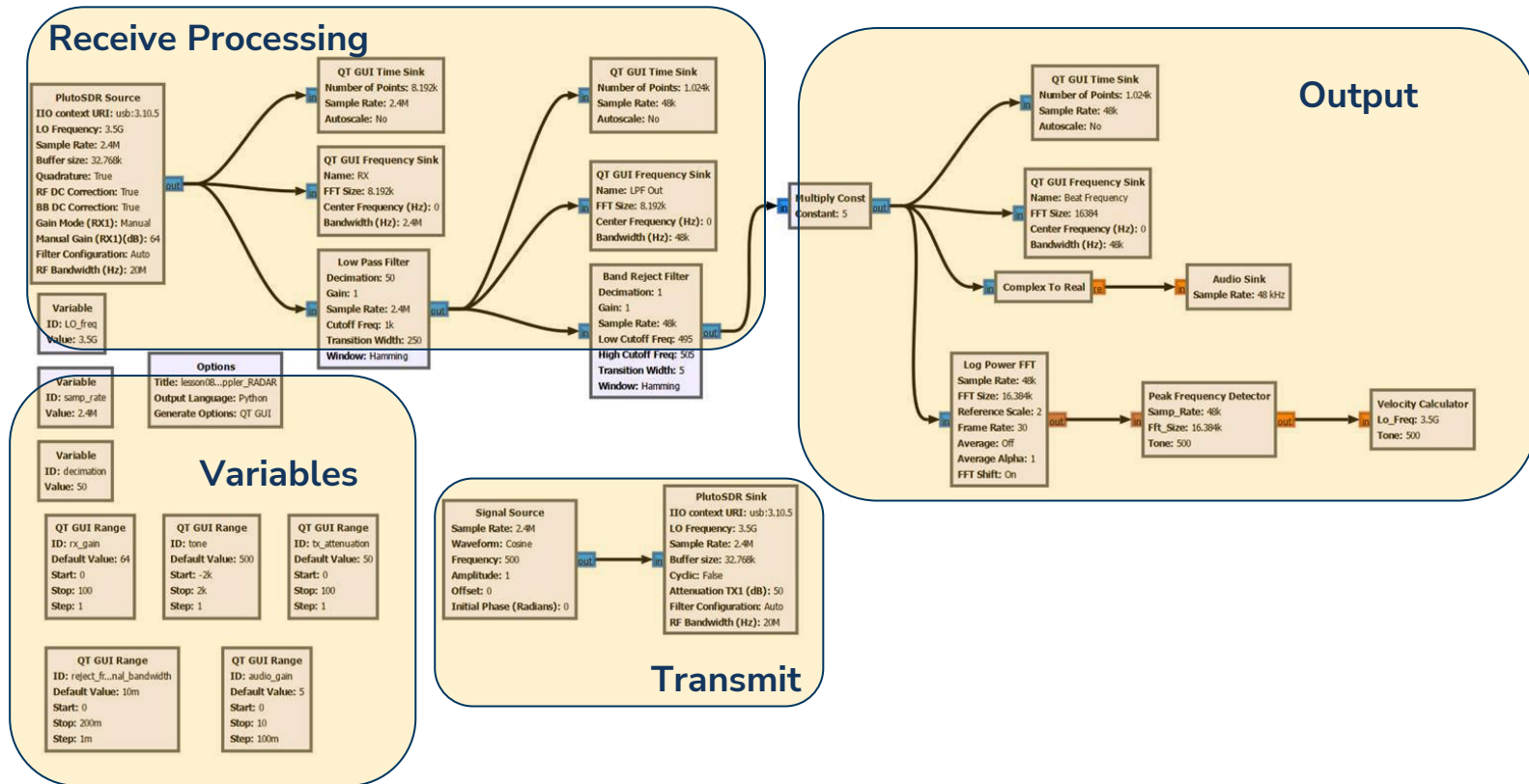
Python Blocks

GNU Radio Flowchart

Overview

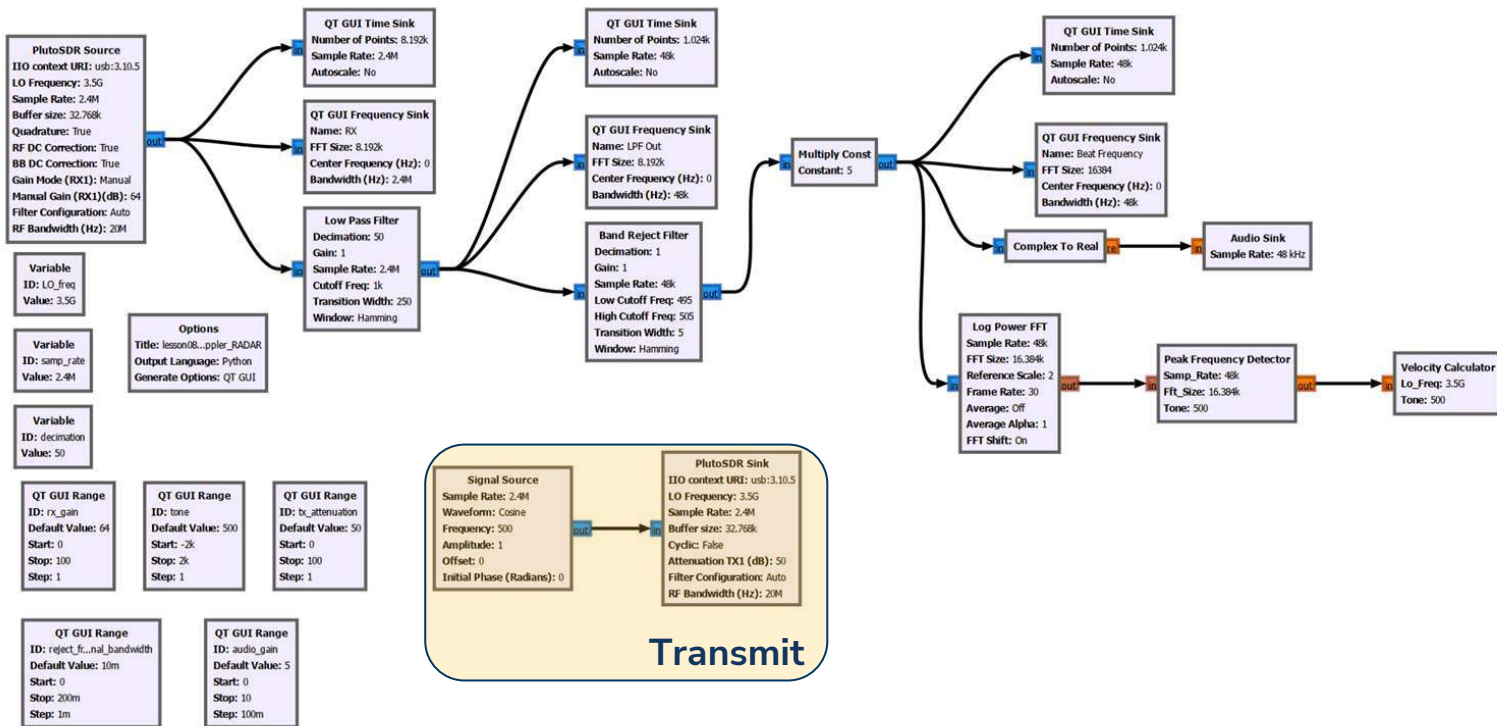


GNU Radio Flowchart



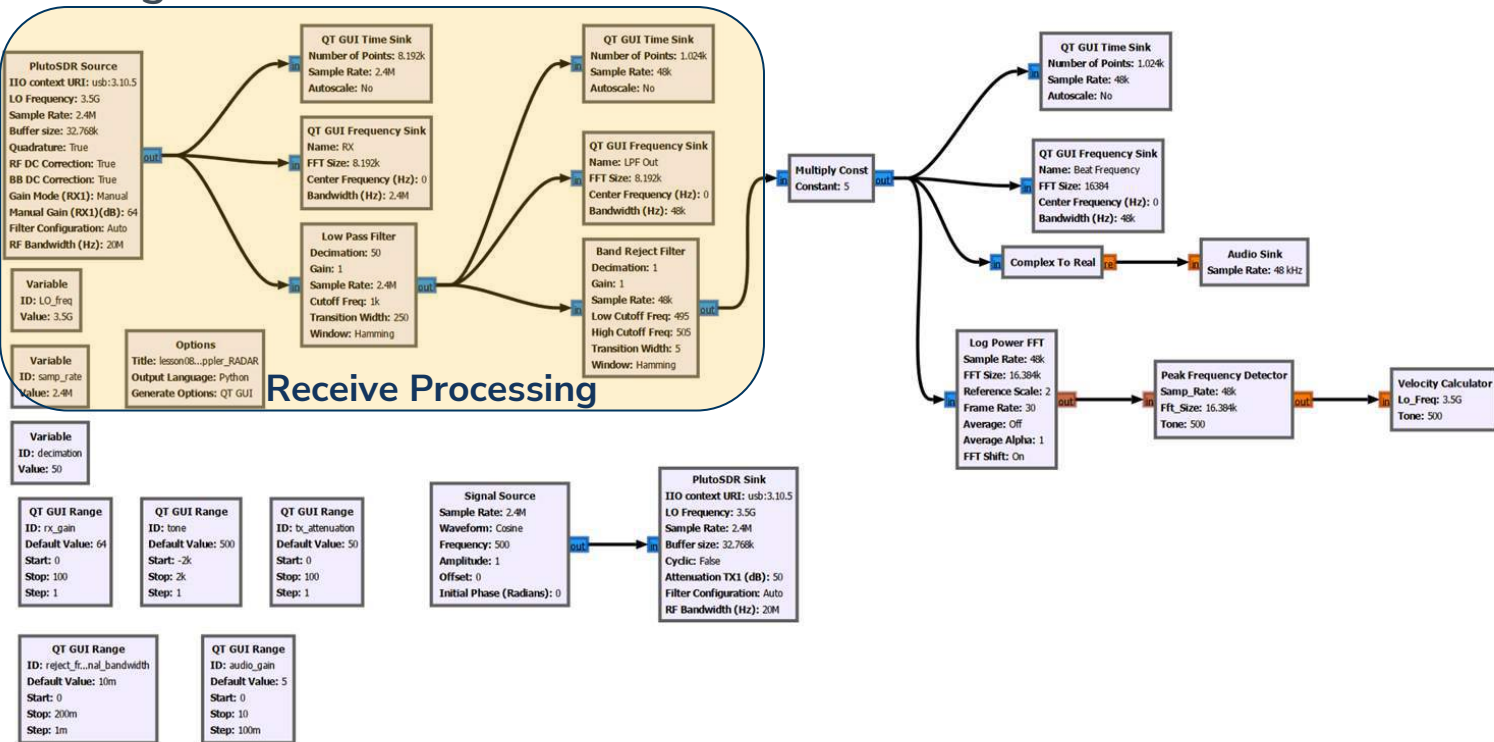
GNU Radio Flowchart

Transmit



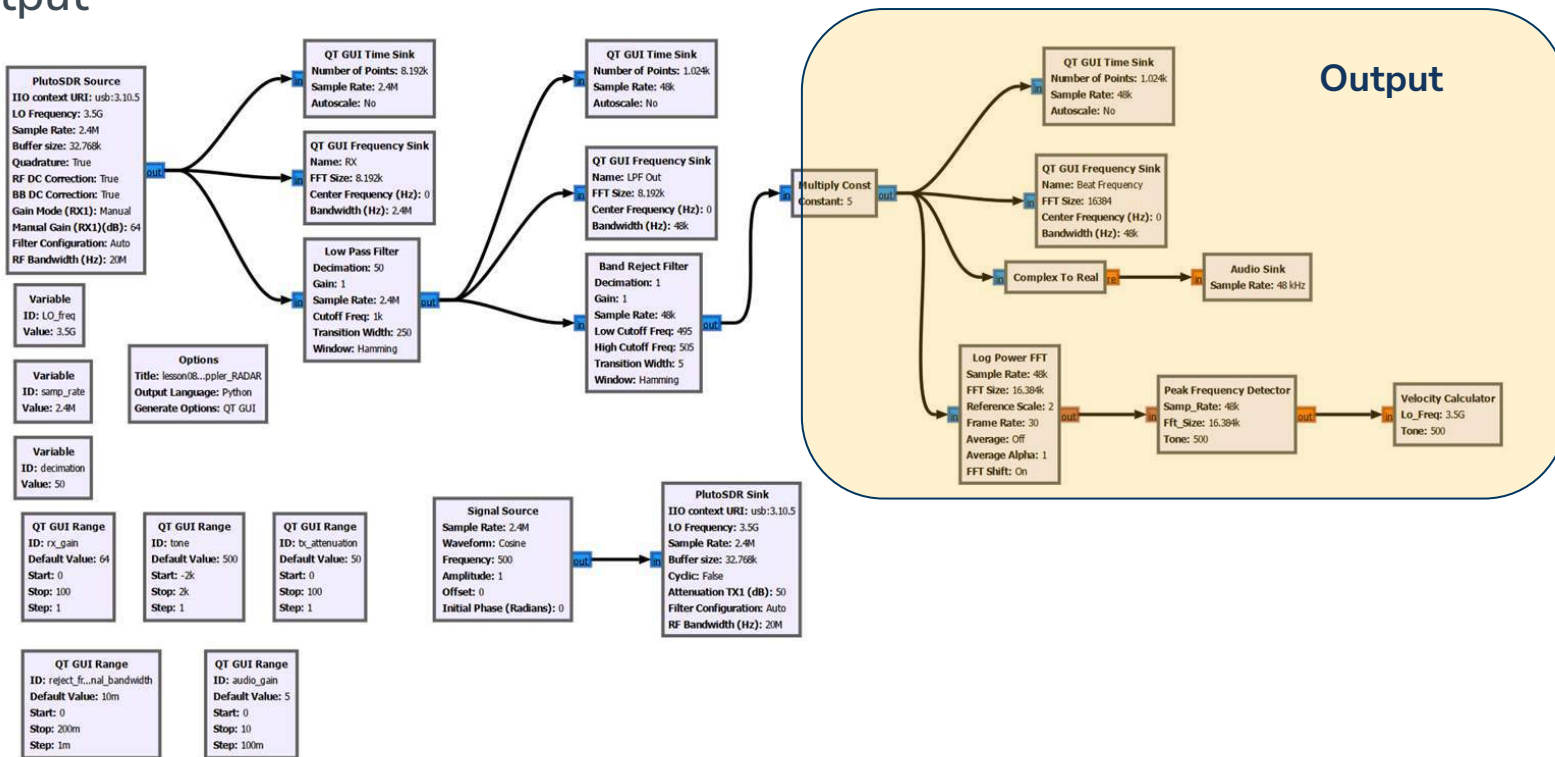
GNU Radio Flowchart

Processing



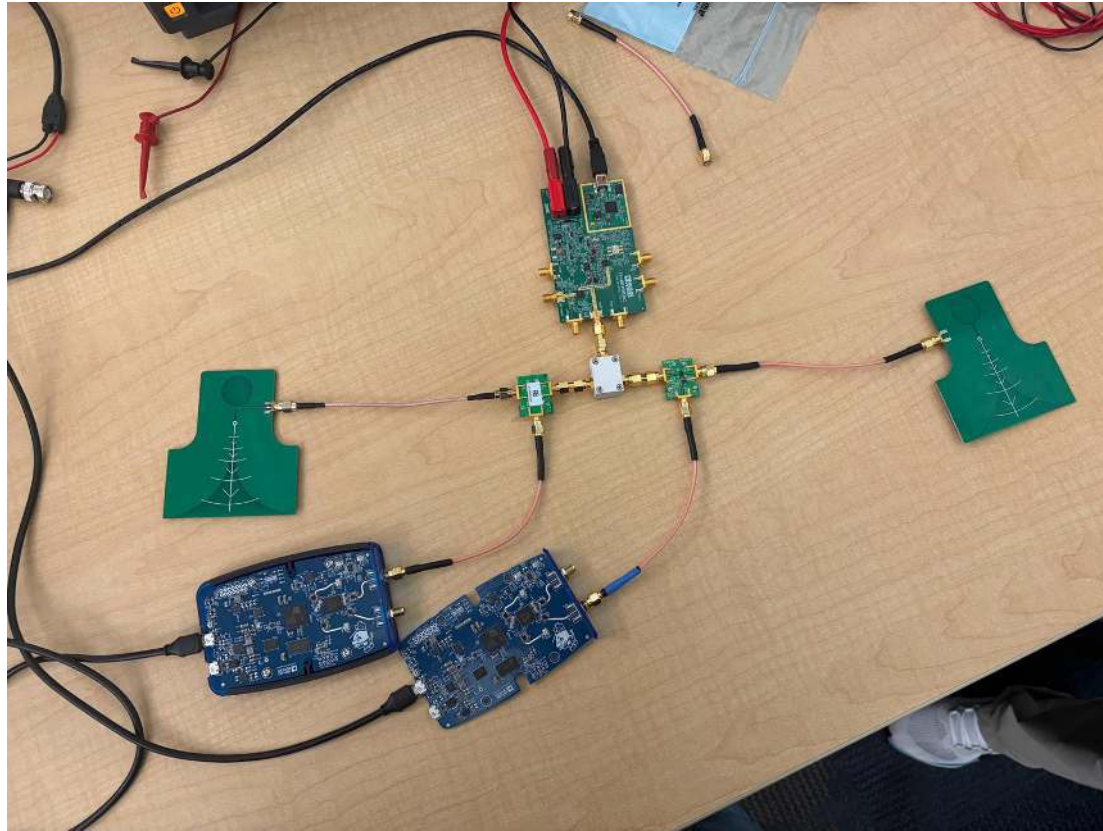
GNU Radio Flowchart

Output

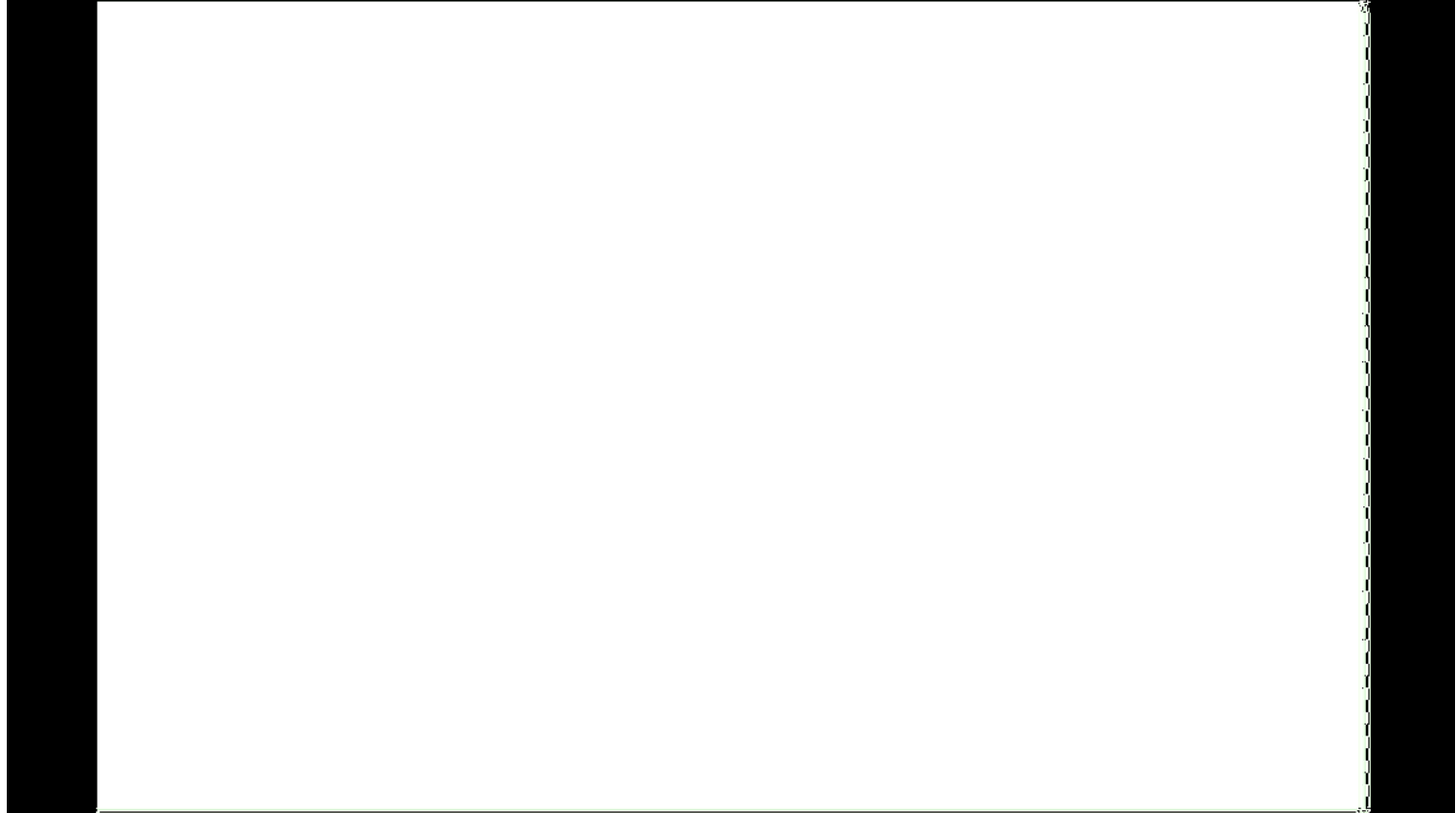


GNU Radio Velocity Test

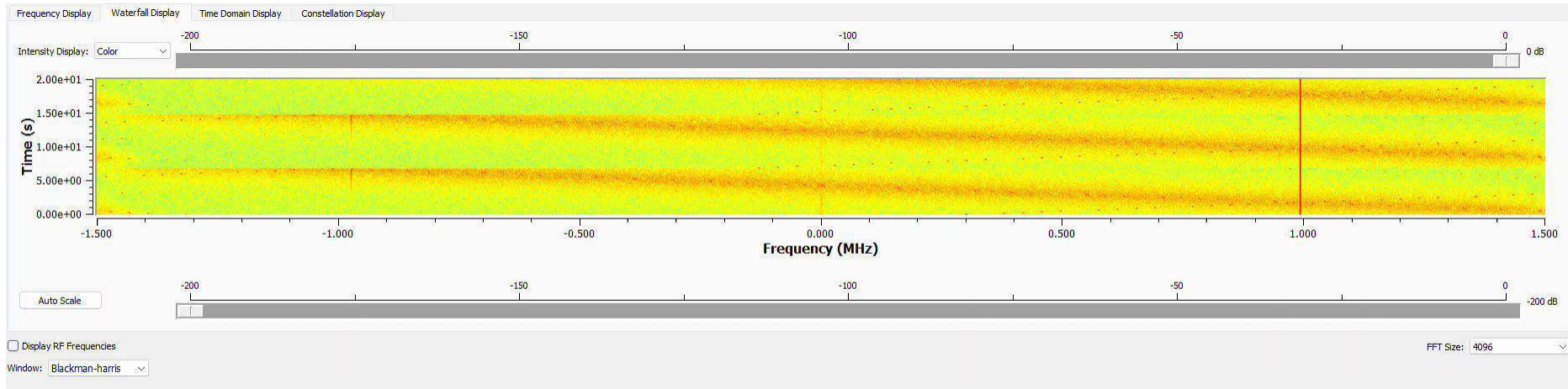
Our current setup



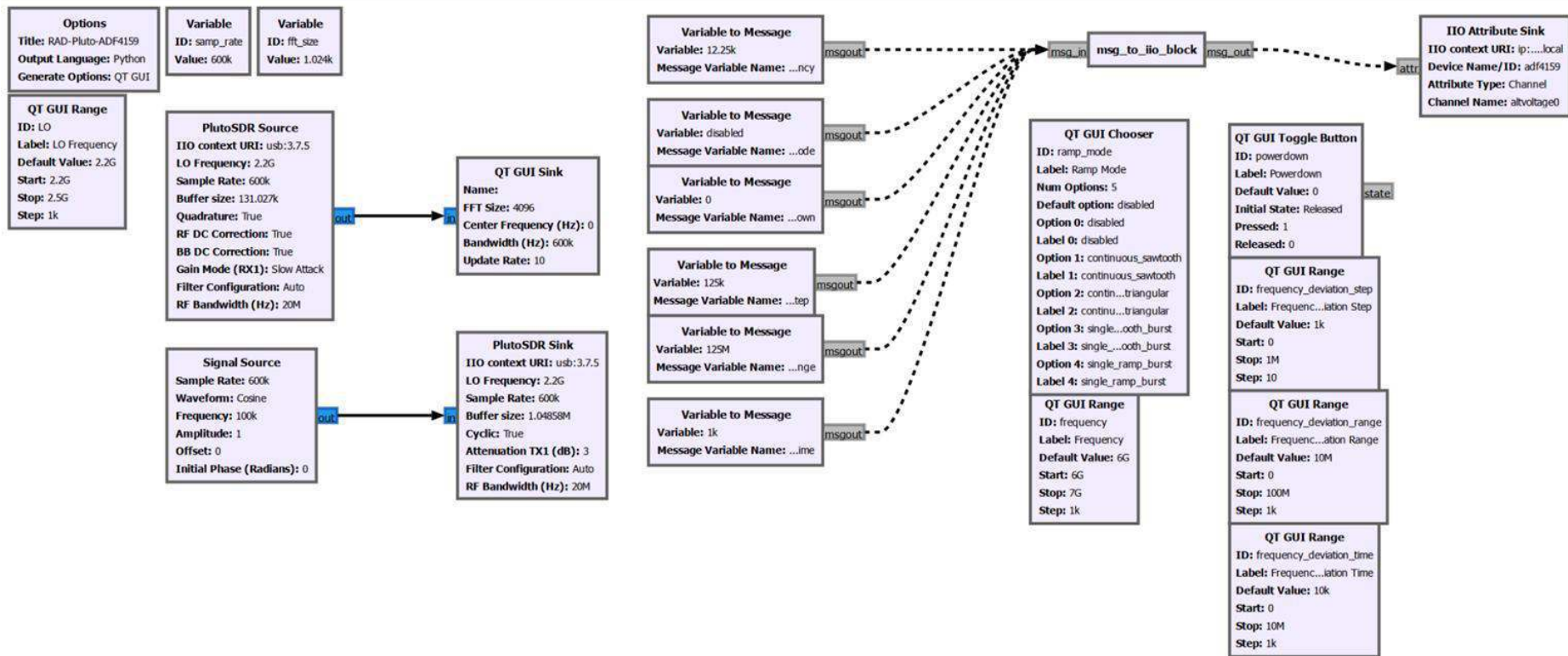
Velocity test



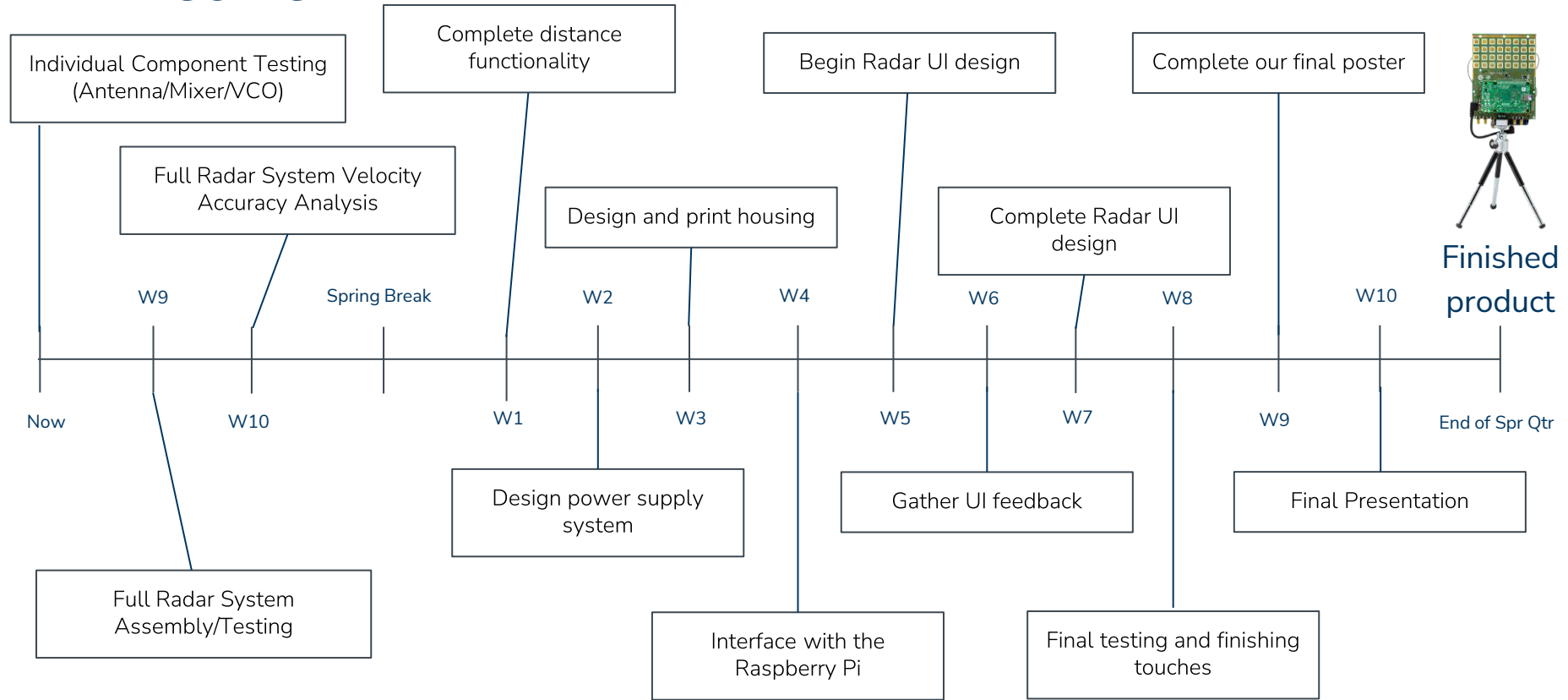
Ramp Visualization



The Entire Setup Testbench



Timeline



UC SANTA BARBARA

Special thanks to:

Yogananda Isukapalli

Tien Nguyen

Lucas Liang

Jon Kraft