



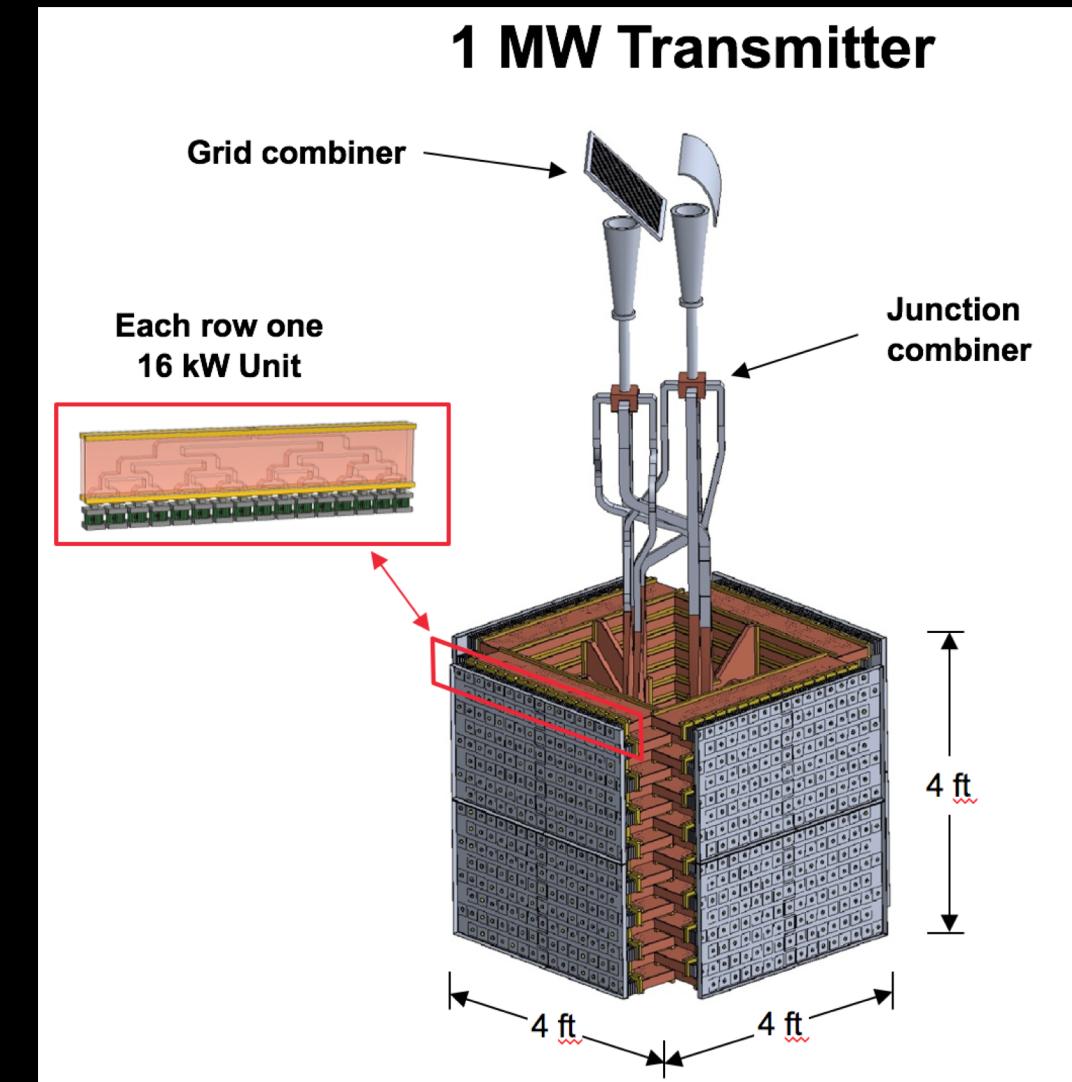
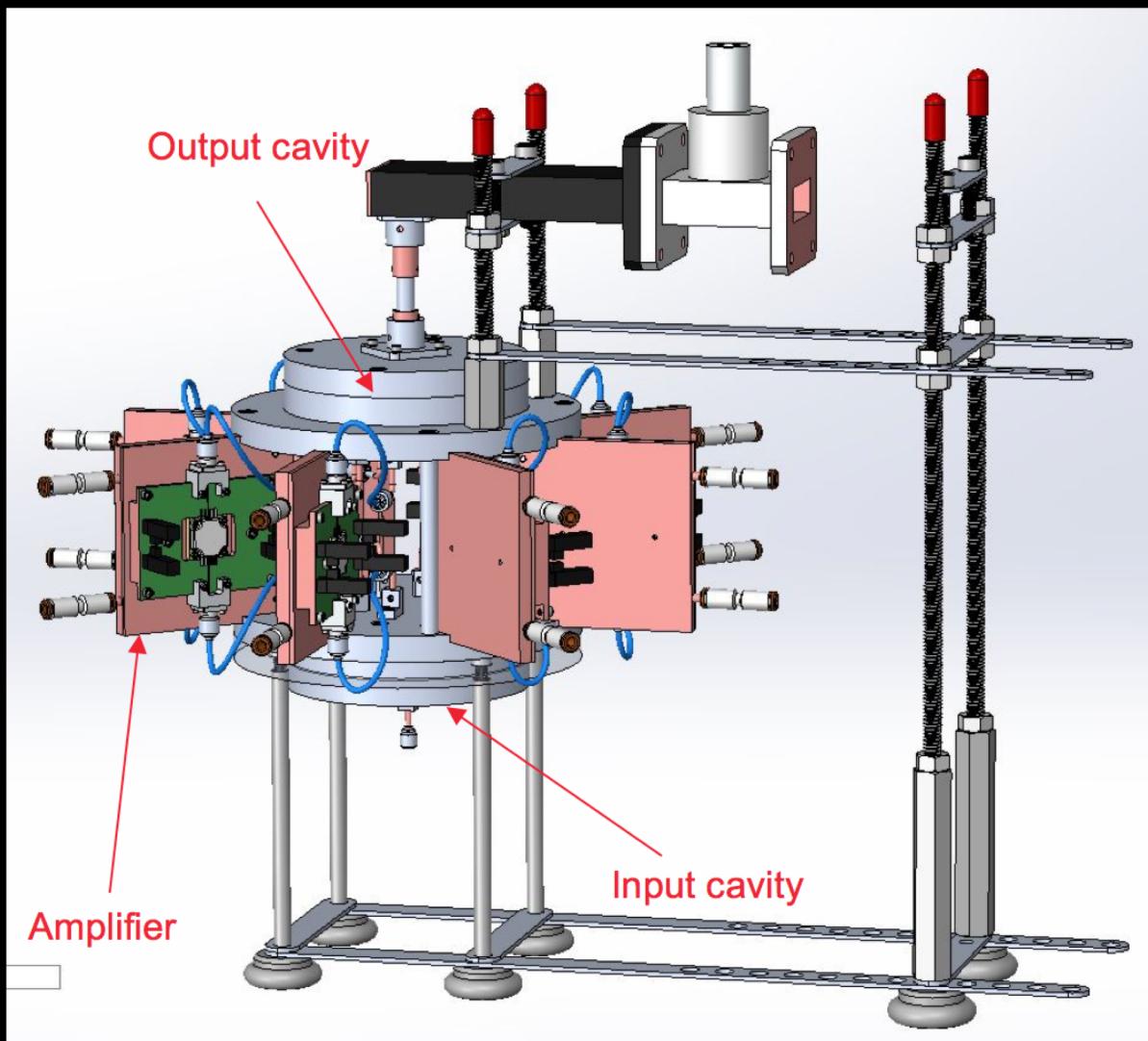
Interfacing and LIDAR Implementation for Space Communications

Francisca Vasconcelos

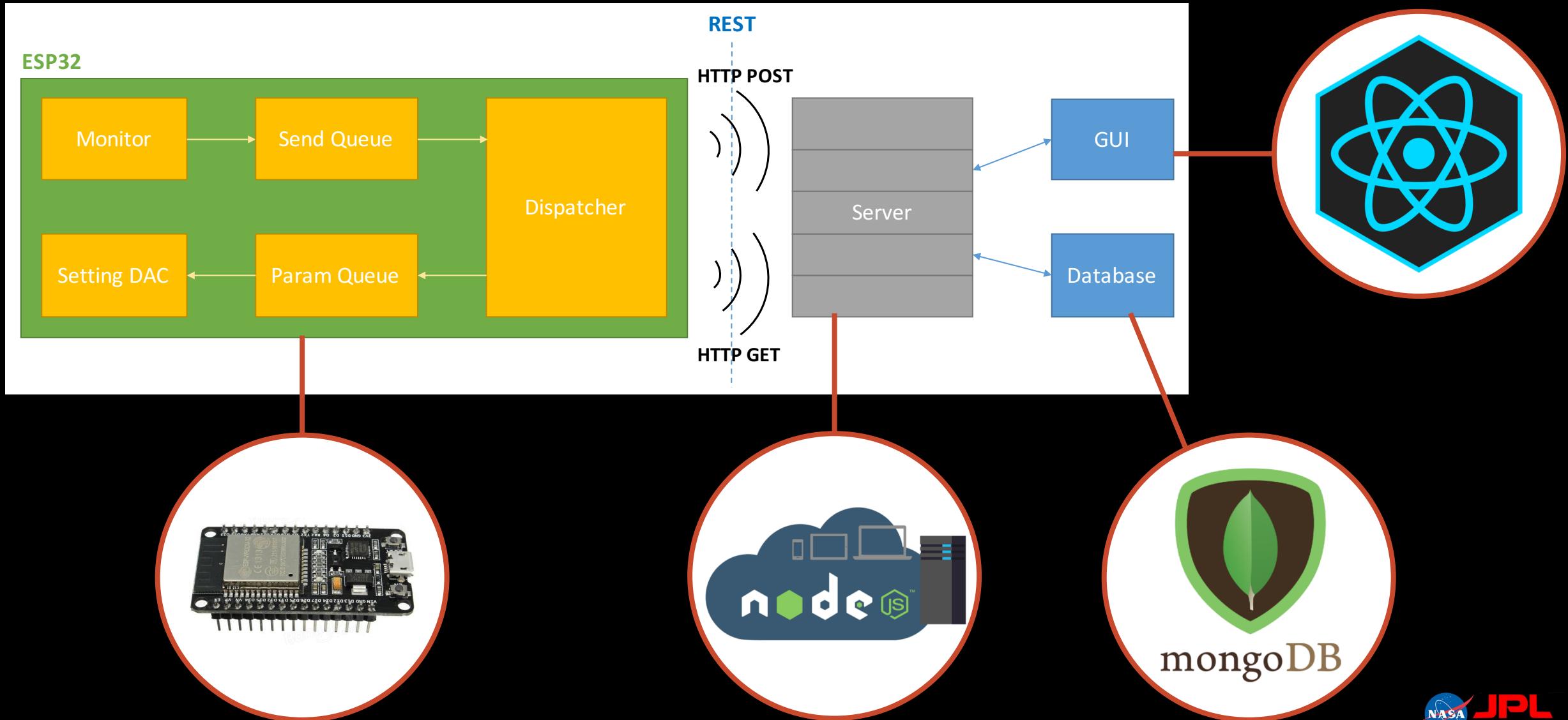
Mentor: Jose Velazco

NASA JPL 333K

Spatial Power Combining Amplifier

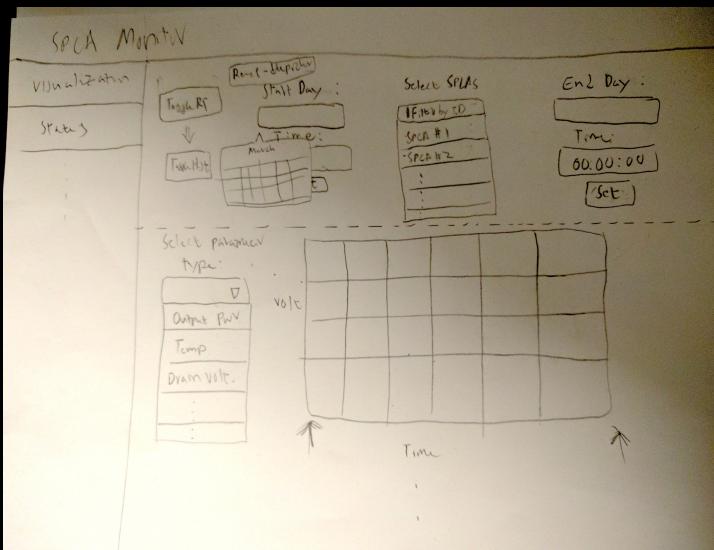
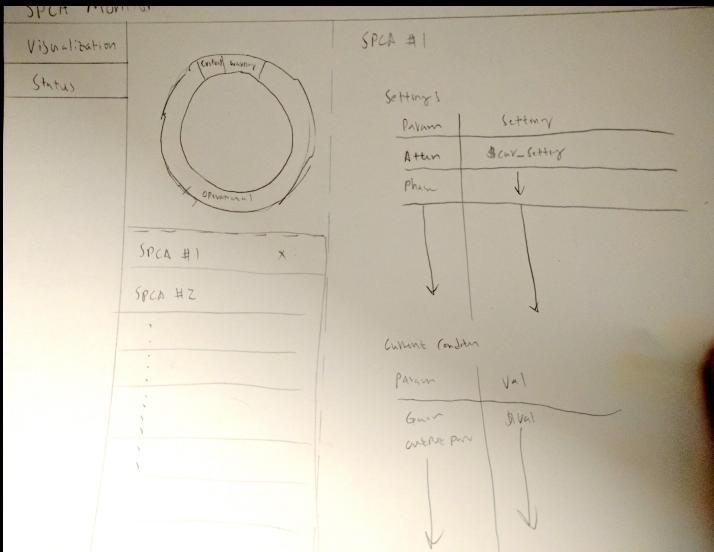


SPCA Prototype System Overview



SPCA GUI Overview

- Goals:
 - Monitor state of the system and individual ESP32s
 - Visualize data - real-time and historic
 - Control ESP32 parameters (gain, temp, ...)
 - Easy-to-use interface
- Learned Javascript and React (used Codecademy)
 - Used Recharts for data visualization



The screenshot shows a dark-themed ReactJS learning page. At the top, there's a logo consisting of a hexagonal pattern of smaller hexagons. Below the logo, the title "Learn ReactJS: Part I" is displayed in a large, bold, light-colored font. Underneath the title, a subtitle reads "Build powerful interactive applications with this popular JavaScript library." A progress bar at the bottom indicates "100%" completion.

Health Monitor Page



The screenshot shows a web browser window titled "SPCA Dashboard" with the URL "localhost:3000/#/module". The dashboard has a sidebar on the left with links: "Health Monitor" (selected), "Visualize Data", "Data Log", and "Testing". The main area features a large circular progress bar divided into red, yellow, and green segments. Below the bar are three buttons: "BAD" (red), "OK" (yellow), and "GOOD" (green). A dropdown menu is open, showing "Select..." and an "x" button. To the right of the bar, the text "ESP32 #<input>" is displayed. At the bottom, there are two CSV files: "esp_data (13).csv" and "esp_data (12).csv". The browser's toolbar includes icons for search, refresh, and various bookmarks like Google Drive, Spotify, YouTube, and Photos.

Data Visualization Page

The screenshot shows a web browser window titled "SPCA Dashboard" at the URL "localhost:3000/#/visualize". The browser has a green header bar with a circuit board pattern. On the left, there is a sidebar with links: "Health Monitor" (selected), "Visualize Data", "Data Log", and "Testing". The main content area has a "Data Type" section with "REAL TIME" and "HISTORY" buttons, where "REAL TIME" is selected. It also includes date and time input fields: "Start Date: 08/15/2017", "End Date: 08/16/2017", "Start Time: 11:01 am", and "End Time: 11:01 am". To the right, there are dropdown menus for "Select ESP32s:" and "Select Parameter Type:", both currently set to "Select...". At the bottom, there are tabs for "esp_data (13).csv" and "esp_data (12).csv", and a "Show All" button.

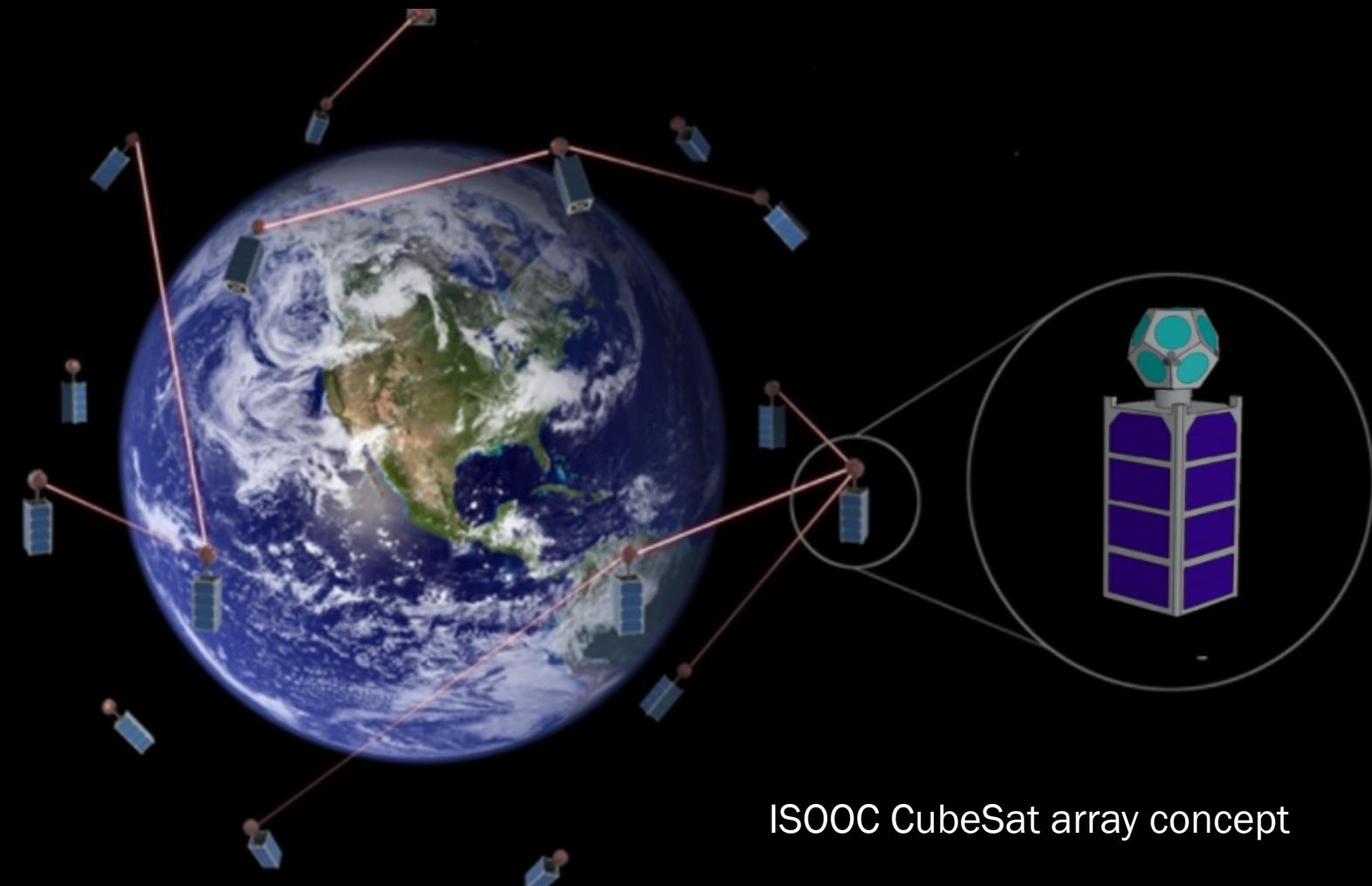
Data Log Page

The screenshot shows a web browser window titled "SPCA Dashboard" with the URL "localhost:3000/#/data_log". The browser interface includes a top bar with tabs like "Courses", "MIT", "Clubs", etc., and a search bar. The main content area is titled "SPCA Dashboard" and contains several sections:

- Health Monitor**: A section with a dropdown for "ESP32 ID" (set to "Select...") and a text input for "# of Rows" (set to "20"). A blue "EXPORT TO CSV" button is present.
- Visualize Data**: A section with a dropdown for "ESP32 ID" (set to "Select...") and a text input for "# of Rows" (set to "20").
- Data Log**: A section with a "Data Type" dropdown showing "REAL TIME" (selected), "HISTORY", and "PAUSE" buttons.
- Testing**: A section with a table header row containing columns: Time, Output Power, Temperature, Gain, Phase, Drain Voltage, Gate Voltage, and Gate Current.

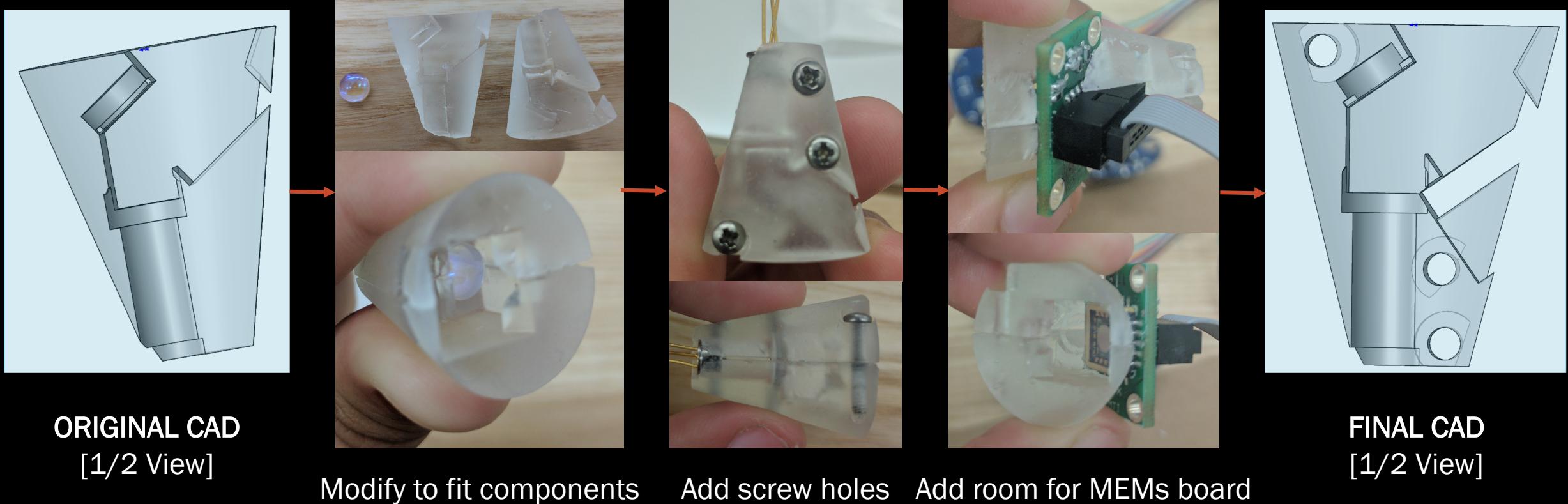
At the bottom of the dashboard, there is a dark footer bar featuring the NASA JPL logo.

Inter-Satellite Omnidirectional Optical Communicator



IS00C Project #1: Redesigning the IS00C TX

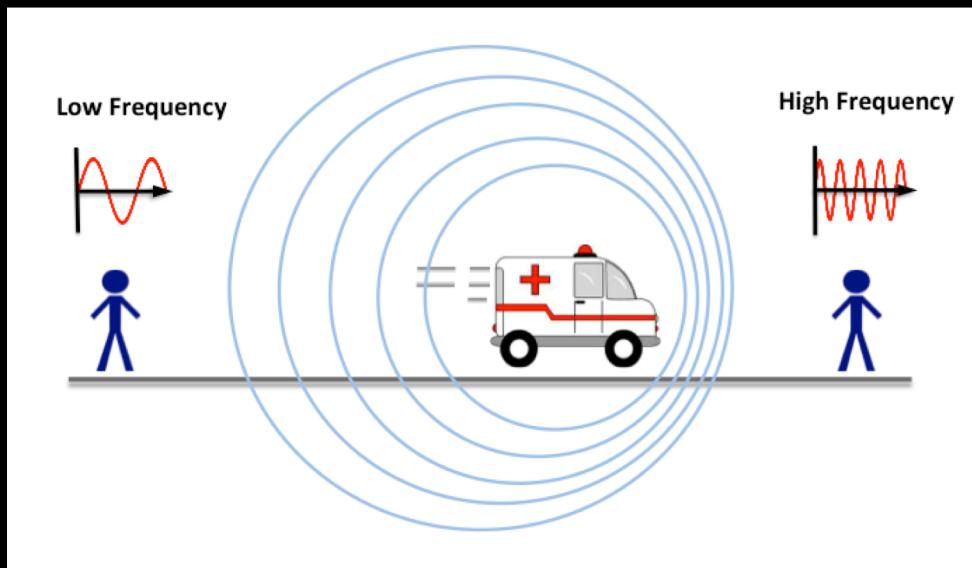
- Needed to fit laser, collimator lens, mirror, and MEMs mirror



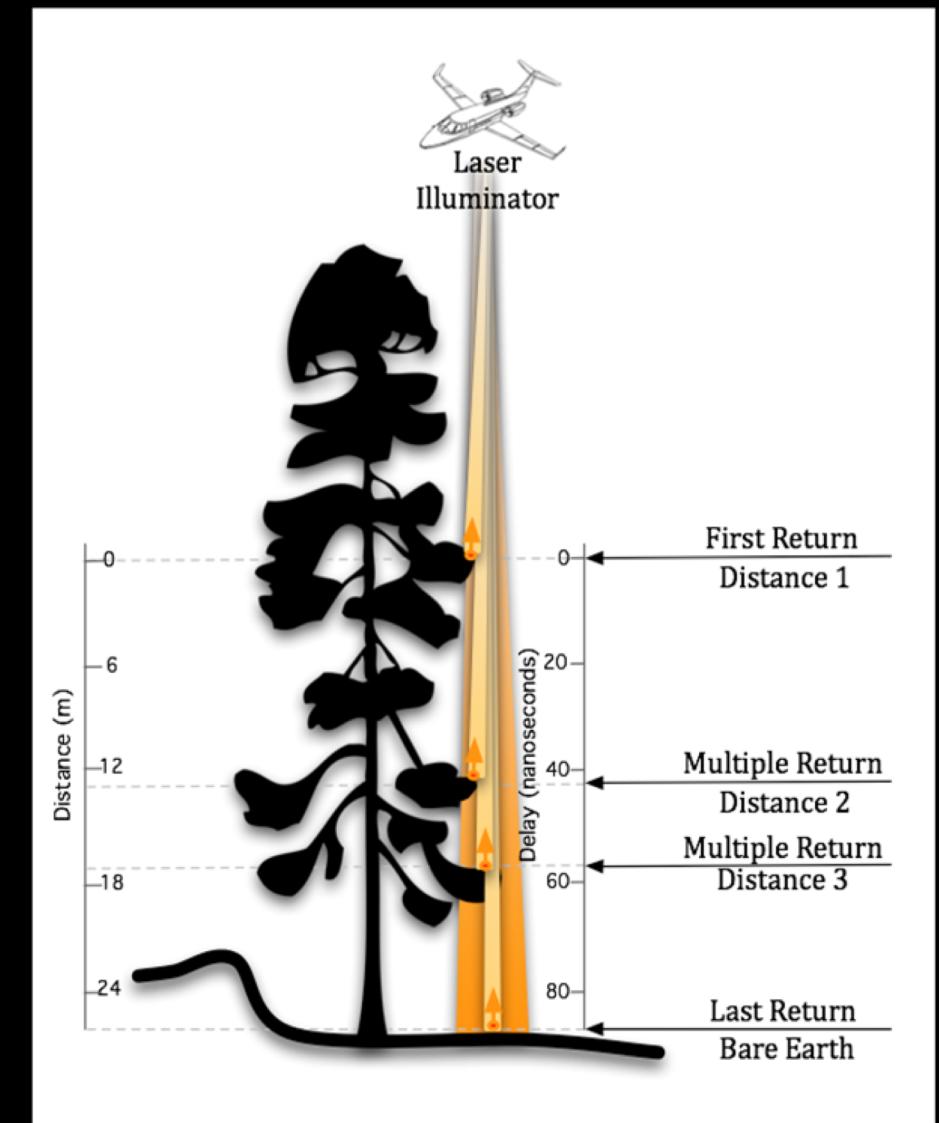
IS00C Project #2: LIDAR

[Light Detection and Ranging]

- Relative Distance
- Relative Velocity
- Depth Maps

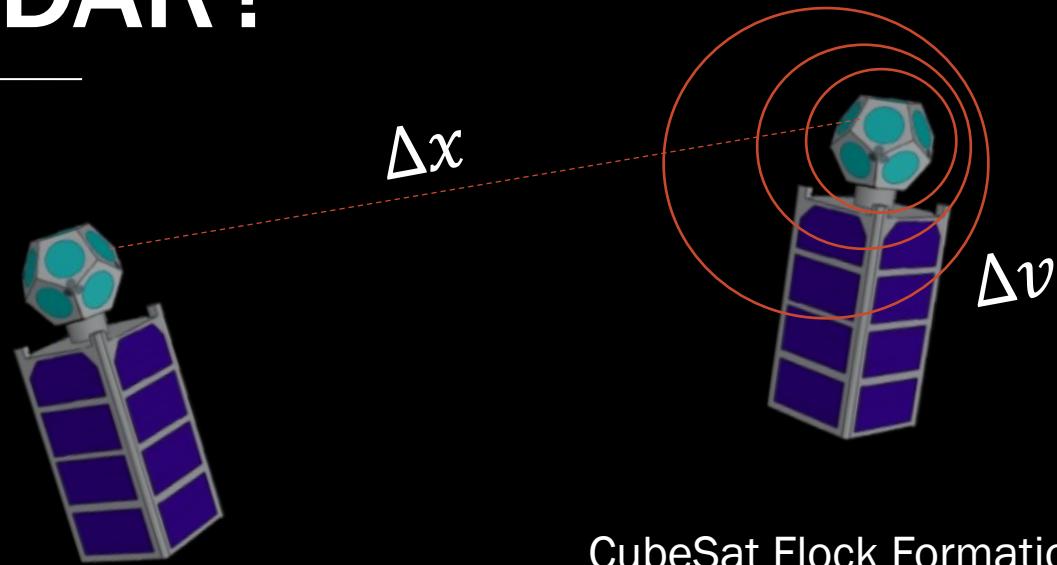


Doppler Effect for velocity measurements

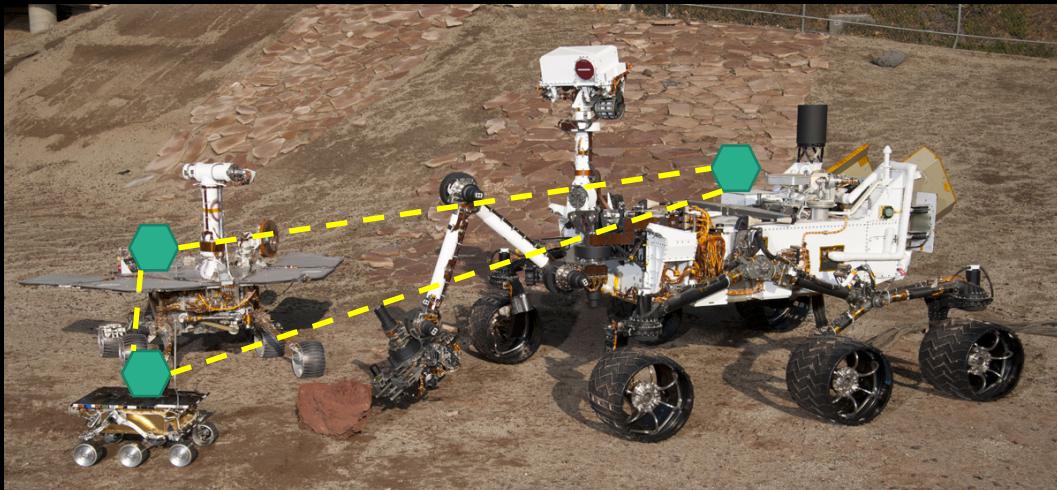


What is LIDAR?

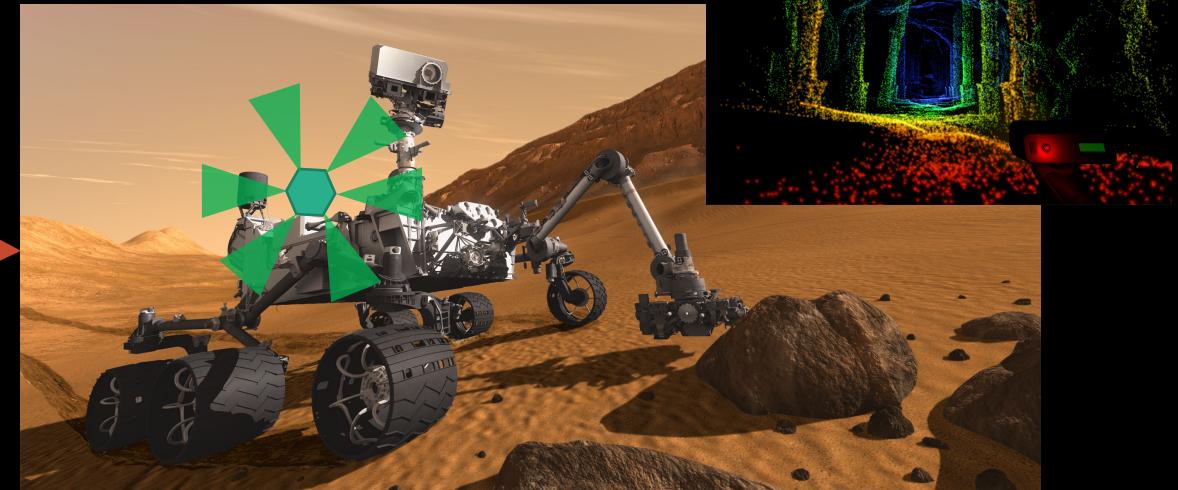
Why ISOOC LIDAR?



CubeSat Flock Formation



Communications

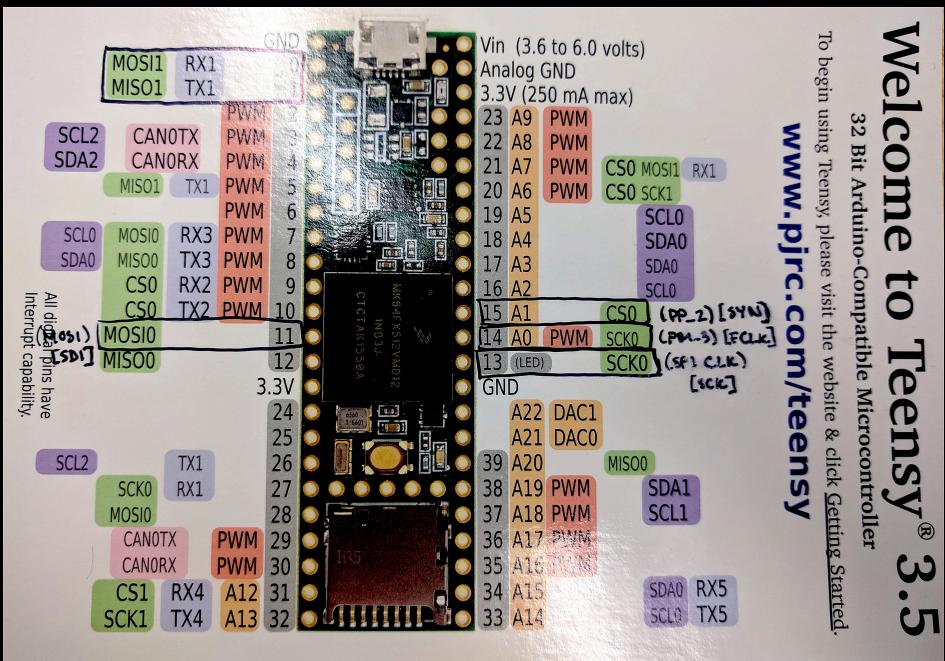


Instrumentation

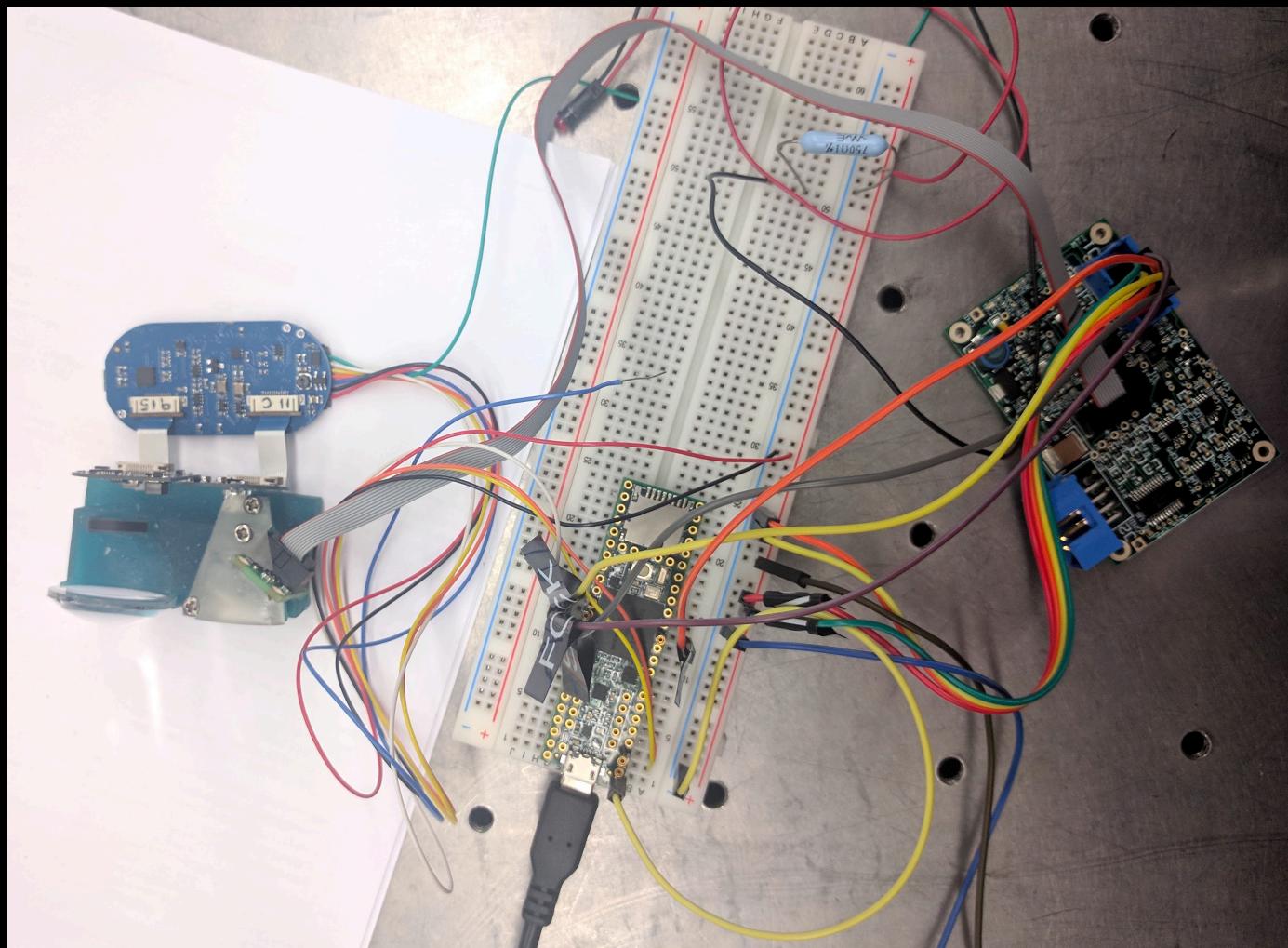
ISOOC LIDAR Hardware



Ordered + Disassembled
Lightware SF11

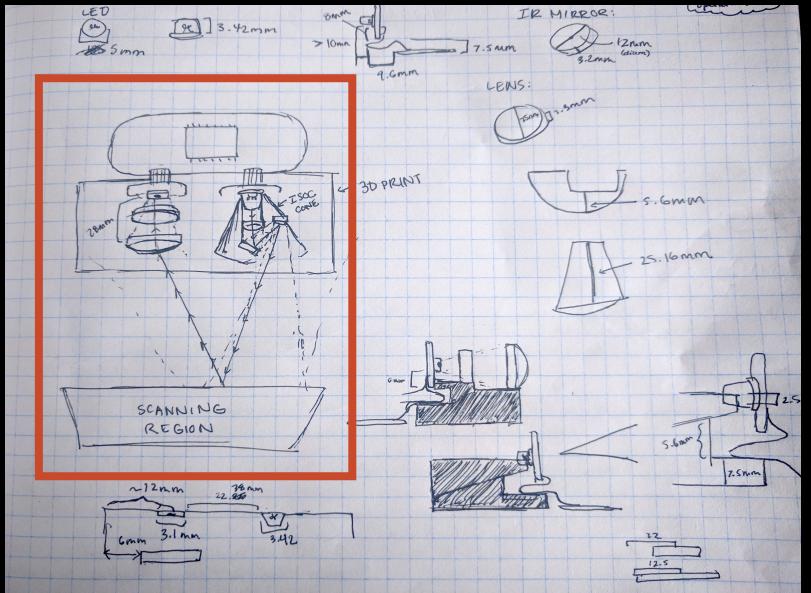


Pin breakout for MEMs driver + rangefinder
serial on Teensy

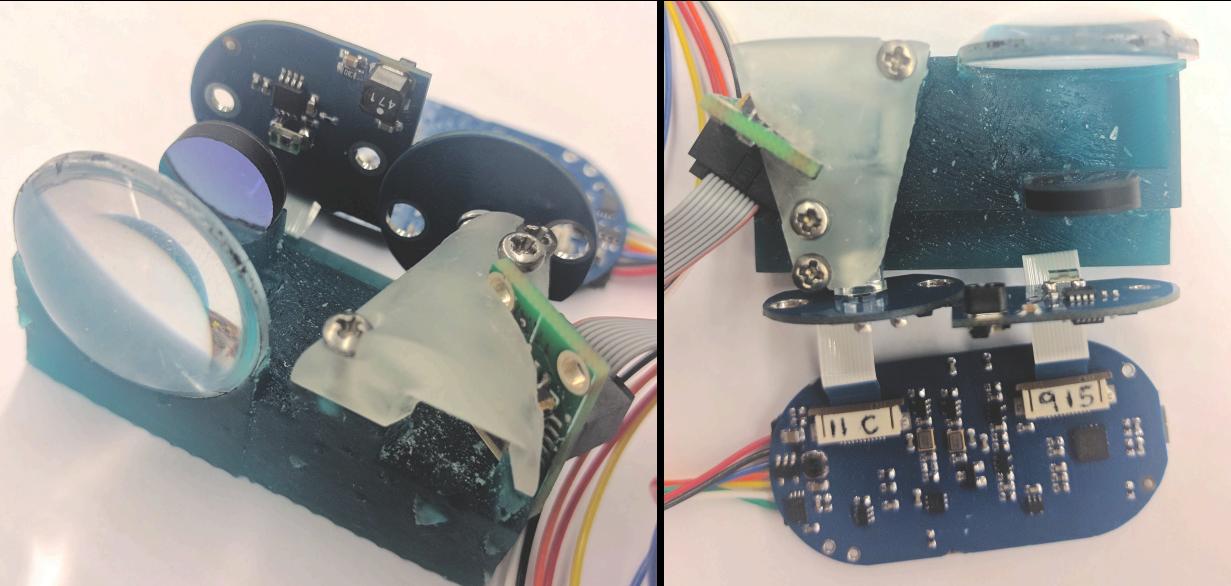


Breadboarding of actual circuit

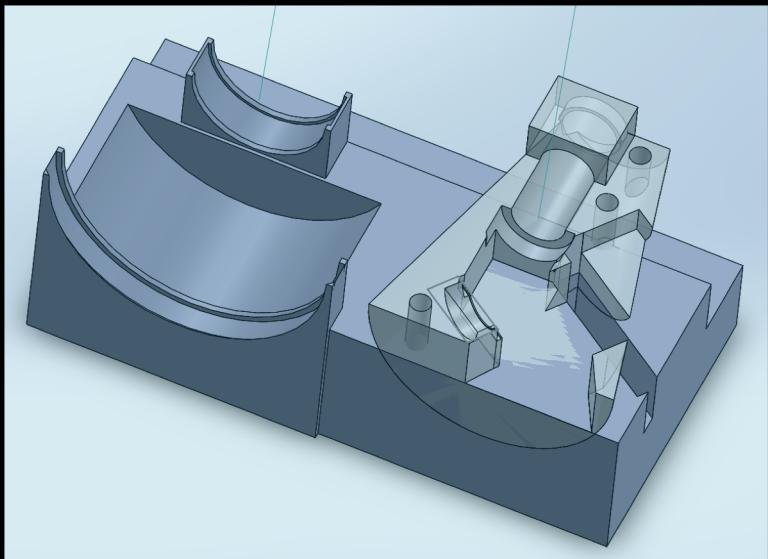
ISOOC LIDAR Assembly



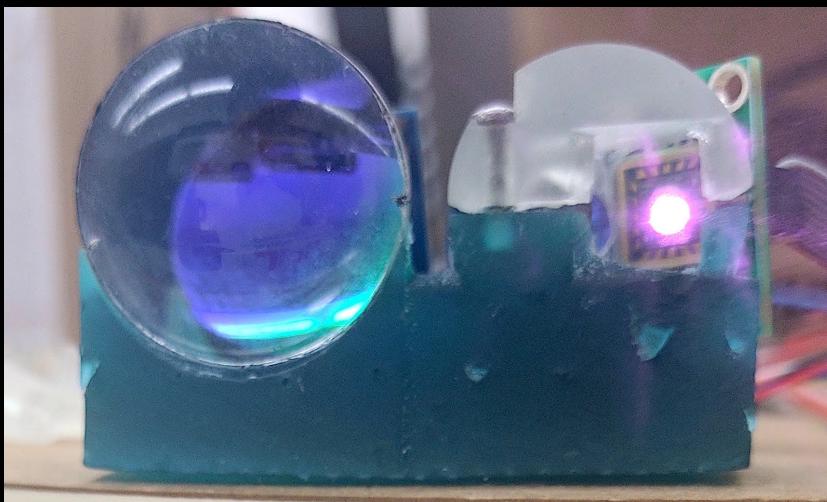
Measurement + Design



3D-printed enclosure with hardware for final assembly



CADing a base/enclosure



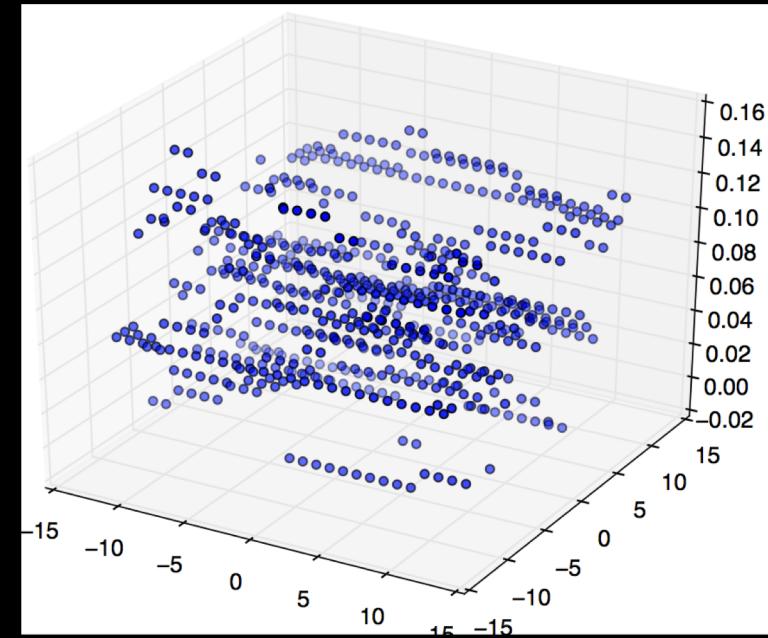
Debugging optics

ISOC LIDAR Software



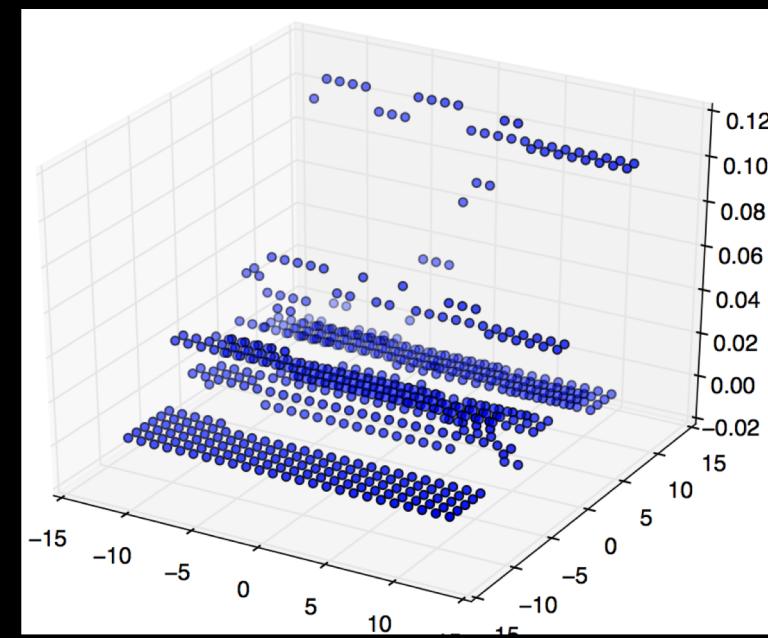
MEMs scanning in action! (Bright spot = IR light reflected on paper, video edited to make more visible)

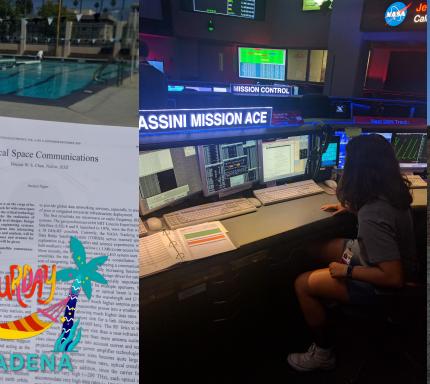
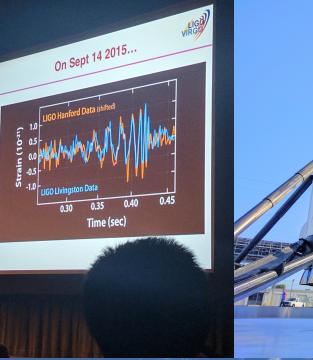
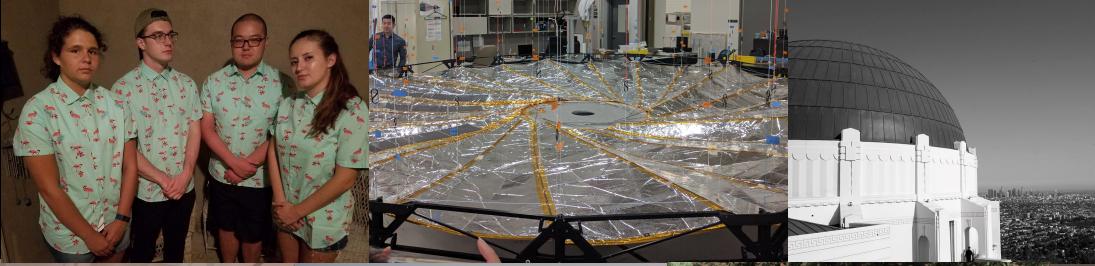
[Arduino Teensy - C]



3D depth maps created using the LIDAR system!

[Python - matplotlib]





QUESTIONS?

THANK YOU!



HACKERMAN

As requested by Maddie Garcia