# Data Collection and Temperature Control for the Prototype Microwave Radiometer
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## Objectives

- Collect and display observed data from radiometer
- Monitor and control instrument working temperature

## Results

- Designed and implemented microcontroller-based temperature control module.
- Used I2C serial communication to collect data from receiver and transfer to computer
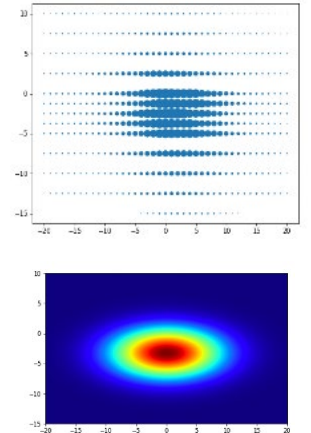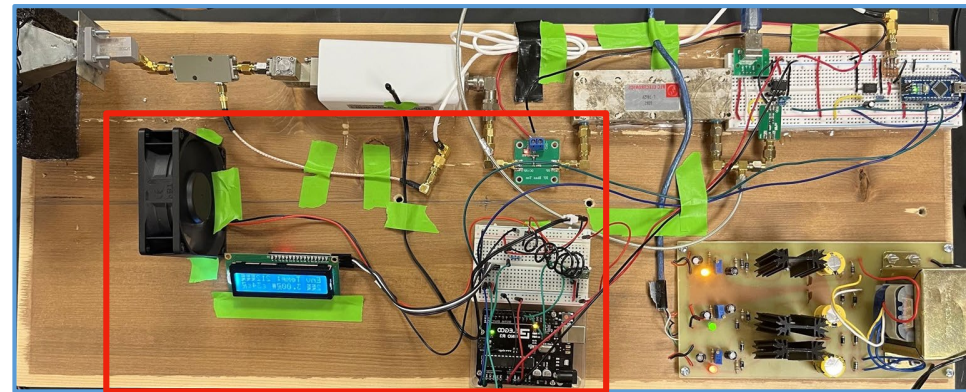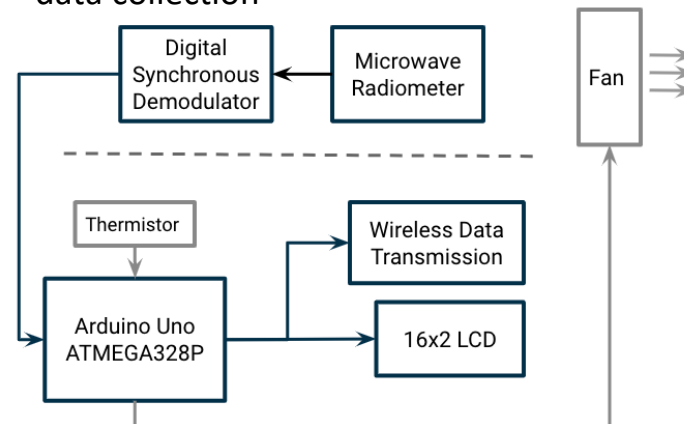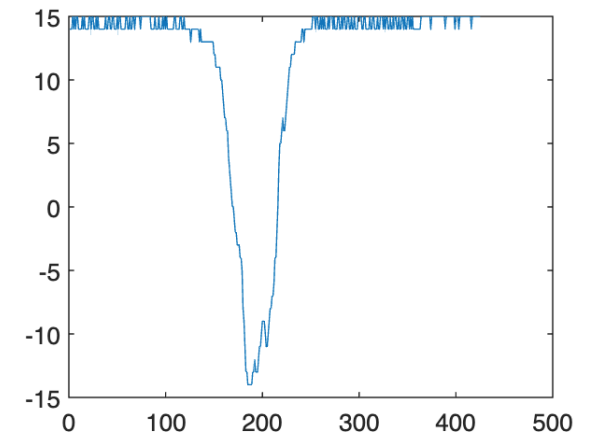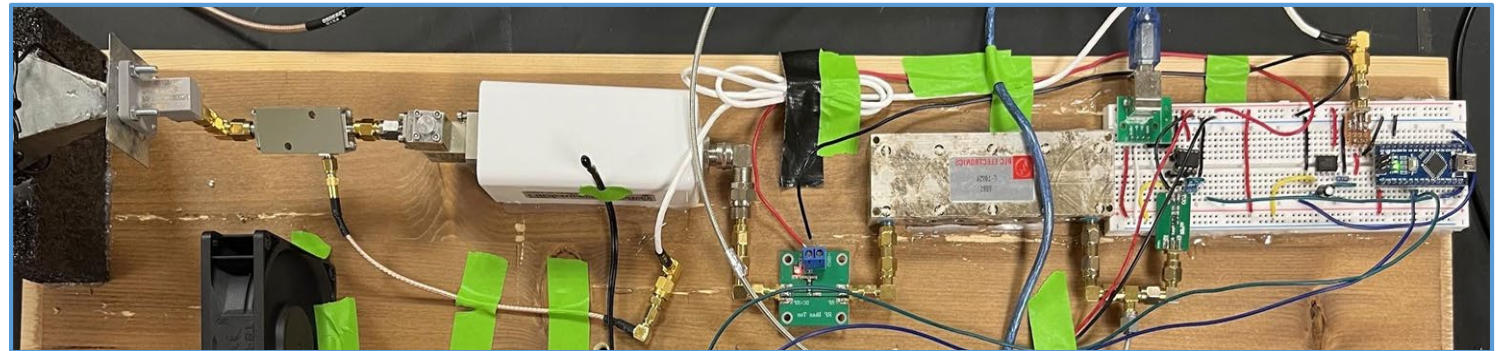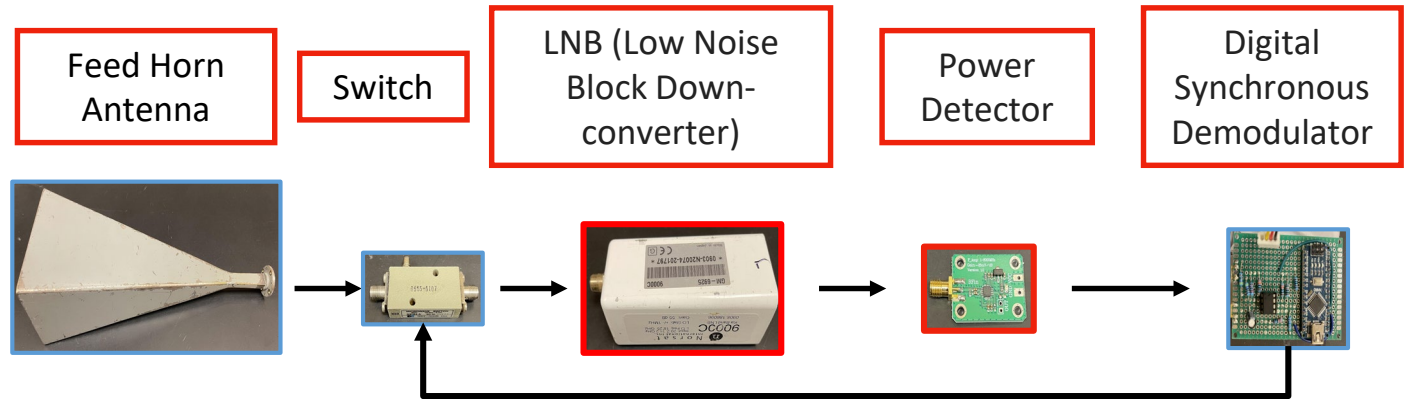
Prototype Microwave Radiometer



Diagram of temperature control and data collection



Graph of collected data from radiometer

# Data Collection and Temperature Control for the Prototype Microwave Radiometer

# Fundamentals of Microwave Radiometer Hardware

- LNB and power detector are sensitive to overheating.
- Stable temperature is needed for the radiometer to reach top performance.
- Data collection system is necessary to display and transfer data between microcontrollers and secondary computer.

Feed Horn Antenna → Switch → LNB (Low Noise Block Down-converter) → Power Detector → Digital Synchronous Demodulator
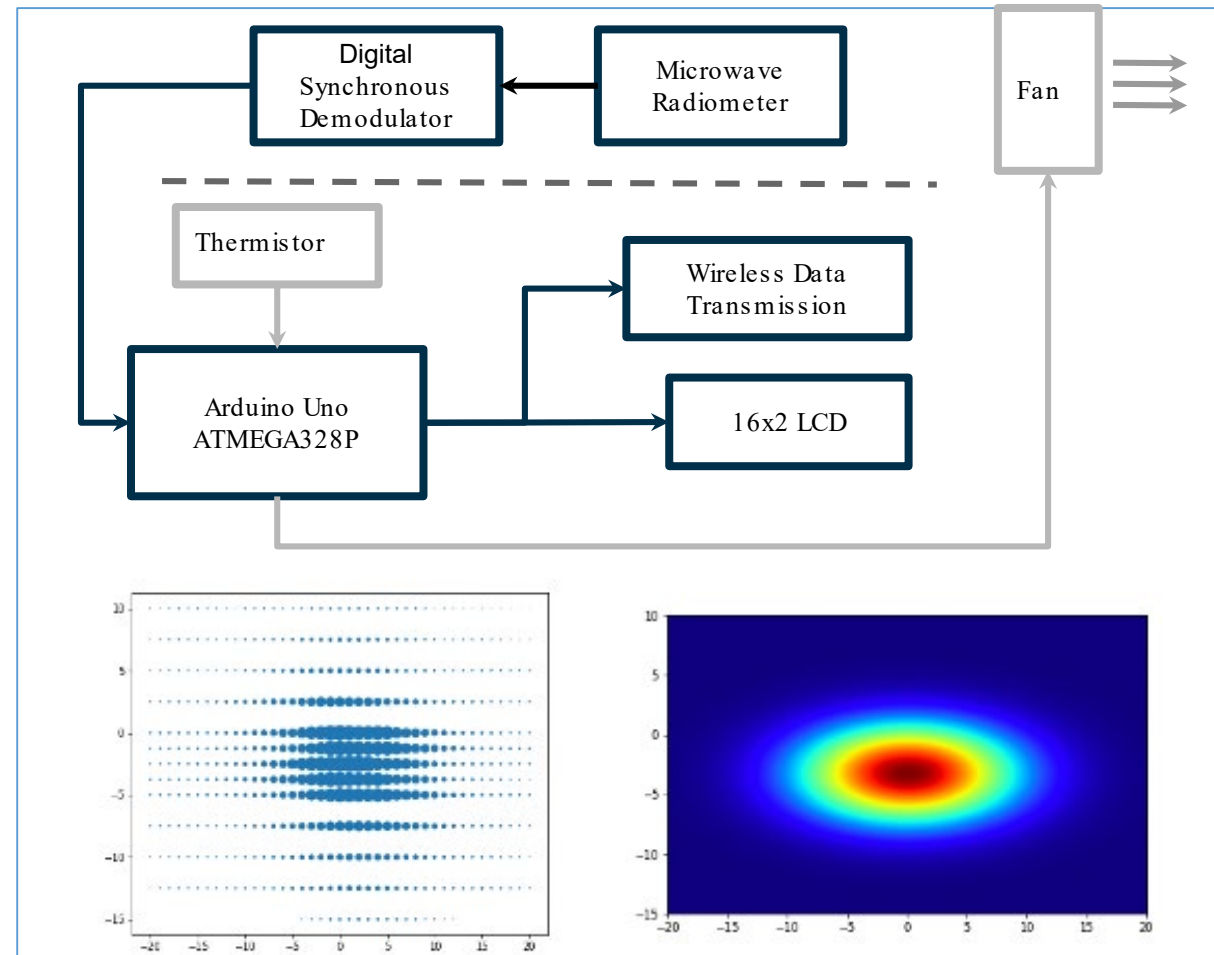
# Temperature Control

- An **NTC thermistor** is placed near a component which is prone to overheating. Temperature is displayed on the **LCD screen**.
- If the thermistor reads a temperature above 30C, the fan will start functioning at low power (30%).
- Fan power increases as temperature increases.
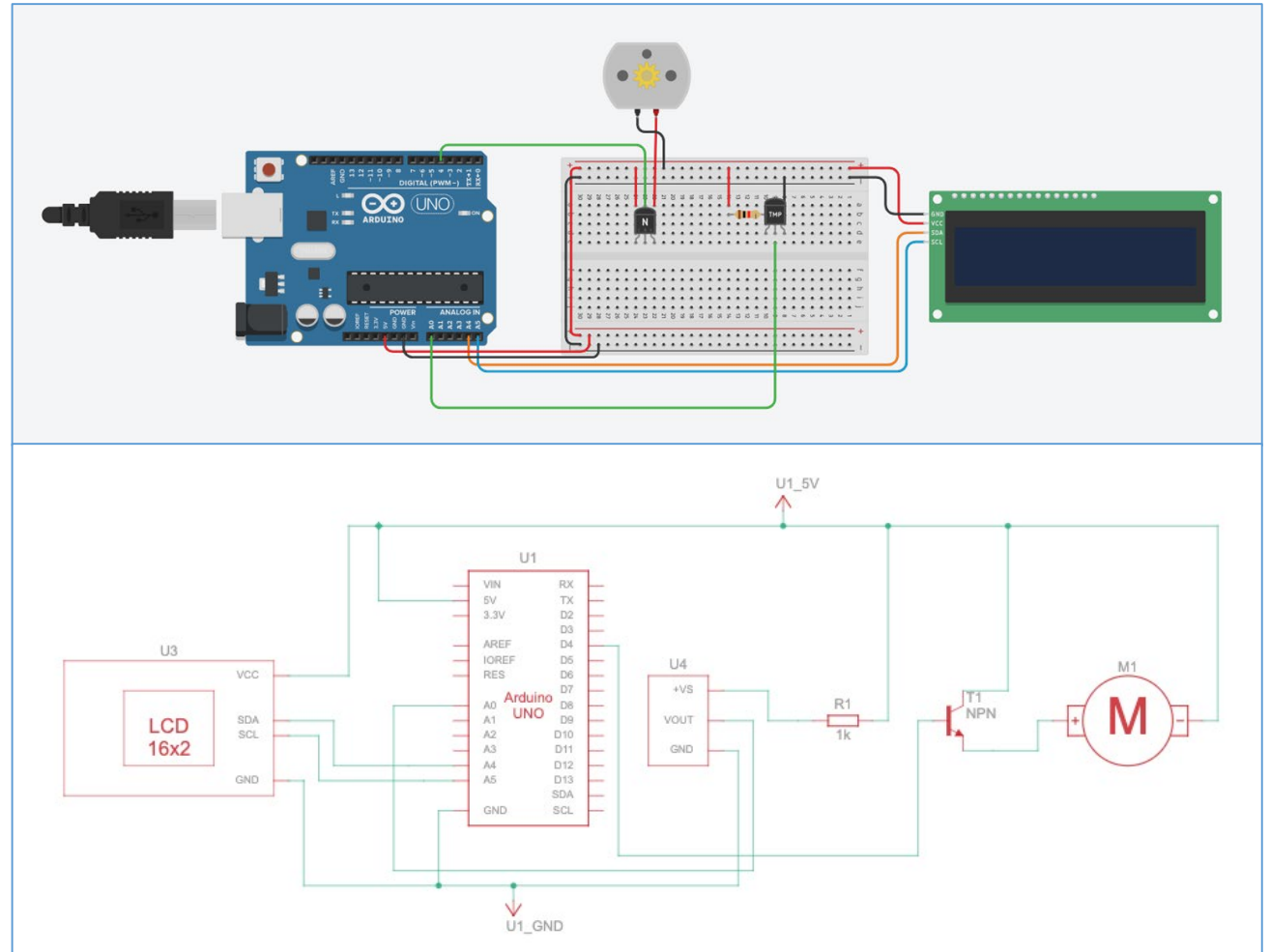
- **I2C serial communication** is established between the digital synchronous demodulator and the second Arduino.

- Data is displayed on an on-site **LCD screen** for convenience.

- Data is also wirelessly transmitted via **433MHz RF modules** and can be received and graphed by a secondary computer.

During this project, I...
➔ Learned working principles of radiometer hardware.
➔ Established temperature monitor and control system.
➔ Learned useful skills to develop hardware and software:
  - I2C serial communication
  - Wireless RF modules
  - Convert thermistor readings from voltage to kelvin/celsius/fahrenheit
  - Control fan and LCD
  - Using interrupts
  - Other: push-button, NE555 timer, OP-AMP, relay.

Possible Improvements:
➔ Upgrade LCD
➔ Second thermistor
➔ Directly use ATMEGA328P microcontroller