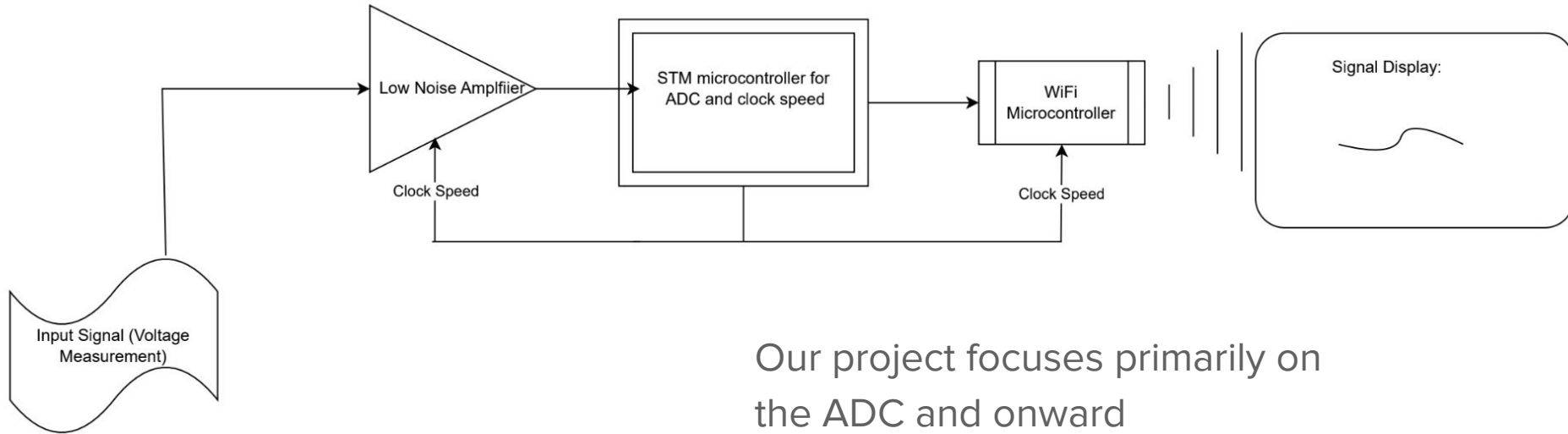# wDAQ

sddec25-06

Team Members: Sam Foster, Merrick Czaplewski, Rocco Yassini, Jerry Liu
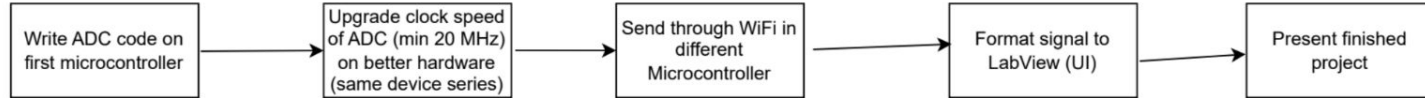Advisor: Manojit Pramanik
Point of Contact: Avishek Das

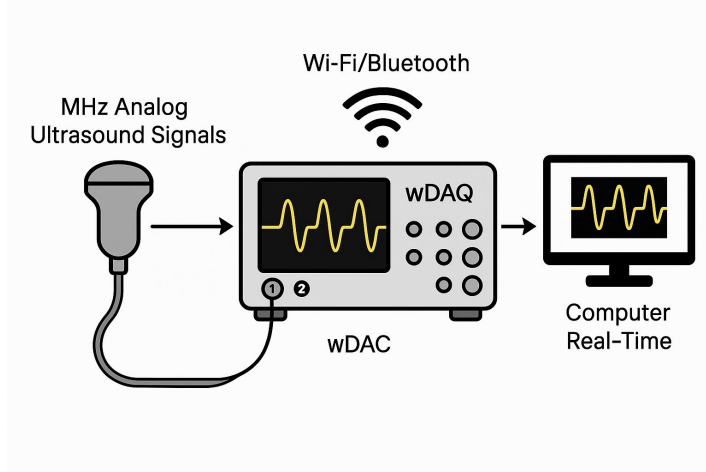# Detailed Design

Low Noise Amplfiier

Clock Speed

STM microcontroller for ADC and clock speed

WiFi Microcontroller

Clock Speed

Signal Display:

Input Signal (Voltage Measurement)

Our project focuses primarily on the ADC and onward

Gantt Chart

Task Name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
ADC Code	░░░	░░░	░░░	░░░								
Upgrade clock speed			░░░	░░░								
WiFi								░░░	░░░	░░░		
Format Output									░░░	░░░	░░░	
Present Finished Project											░░░	░░░

Write ADC code on first microcontroller → Upgrade clock speed of ADC (min 20 MHz) on better hardware (same device series) → Send through WiFi in different Microcontroller → Format signal to LabView (UI) → Present finished project

Resources Integration:

1. Hardware components:

STM32H7 series microcontroller: with high clock frequency, used for high-speed data acquisition and processing.

ADC module:

Sampling rate: 20–25 MS/s

Resolution: 12-bit

Input voltage range: ±2V

Input impedance: 50 Ohm / 1 MOhm

Low noise amplifier (LNA): gain > 50 dB

Wi-Fi module (ESP32): for wireless data transmission.

PCB board: SMT components are used, and flexible substrates are recommended to reduce system size and weight.

2. Software tools

STM32 development environment (such as **STM32CubeIDE**)

LabVIEW: used to develop graphical user interfaces (**GUIs**)

Signal processing and debugging tools: such as spectrum analyzers and oscilloscopes

User Needs :

Wireless & Portable
Replaces BNC cables; supports remote use

Real-Time MHz Acquisition
Fast sampling; supports real-time or buffered mo

Clean & Stable Signal
Low-noise amplification; strong EMI shielding

Modular & Scalable
2 channels/module; supports multi-module setup

User-Friendly GUI
LabVIEW-based interface for control and display

Reliable & Affordable
Stable performance with controlled cost

1.Wireless & Portable

Replaces BNC cables; Realize wireless collection and transmission of multi-channel data.

2.Real-Time MHz Acquisition

Fast sampling; supports real-time or buffered mode.

3.Clean & Stable Signal

High-gain, low-noise signal amplification and filtering module.

4.Modular & Scalable

Two channels/module (one trigger and one acquisition); supports multi-module setup.

5.User-Friendly GUI

LabVIEW-based interface for control and display.

6.Reliable & Affordable

Stable performance with controlled cost.

Description of Users (Personas)

-Lab Faculty: Want to be able to conduct experiments using oscilloscopes without the constraints of a wired device. Want to make efficient use of lab space.

   -Primary user will be the Lab Technicians in the ultrasound lab.
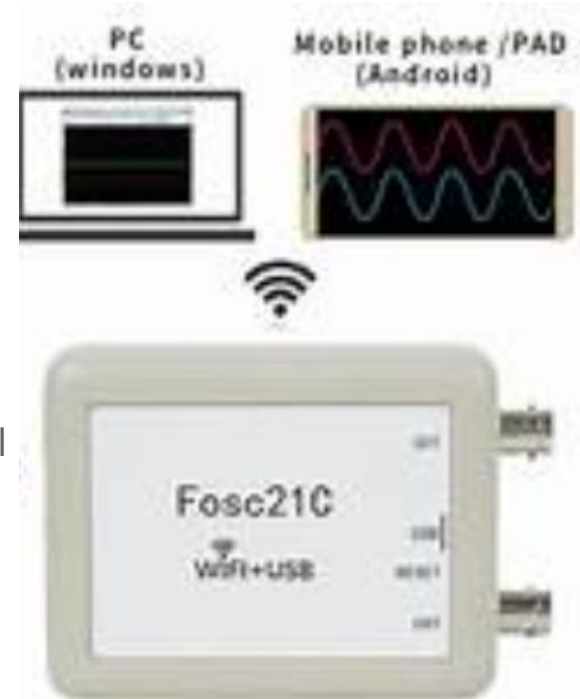

-Students: Want to use convenient & simple measurement tools to complete their labs.

-Lab Management staff: Want to avoid clutter and make best use of space available.

Conclusion

-We seek to develop a wireless and mobile oscilloscope to be utilized in the Ultrasound Lab.

-Mix of software and hardware skills will be used to accomplish this.

-Most lengthy part of the project is coding the STM microcontroller. Particularly, ensuring the shape of the input signal is maintained after being converted from analog to digital.

-Ideally, the wDAQ will allow the ultrasound lab technicians to conduct experiments they were previously unable to, and help them achieve useful breakthroughs in their research.

Questions?