# Shiver-Ring

CDR Presentation for Team 2

Michael Burton, Connor Loughman, Adam Maciaszek, John Murray

Updated Problem Statement

When diabetic patients sleep their blood sugar levels can drop and result in hypoglycemic events, if the patient is unable to wake these events can go untreated and result in coma and even death.

Blood Sugar levels in a Type 1 Diabetes Patient Over Time
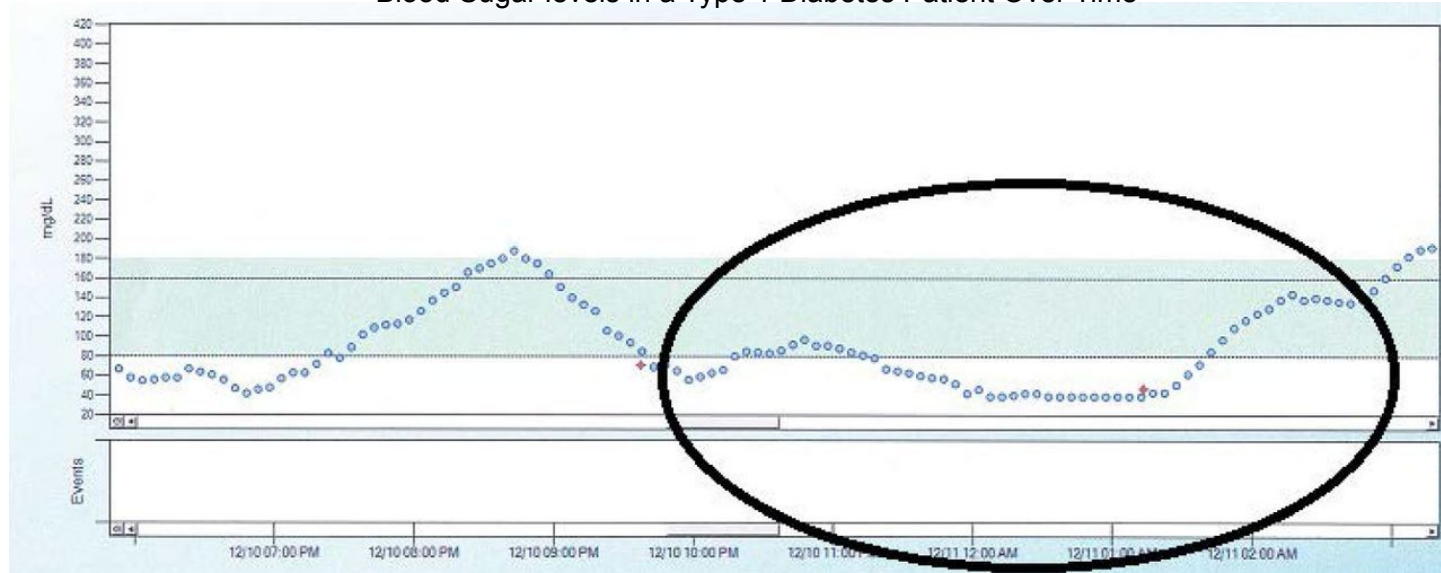
(Source: *Unger J:* Diabetes Management in Primary Care. *2nd ed. Philadelphia, Pa., Lippincott, Williams, and Wilkins, 2012.*)
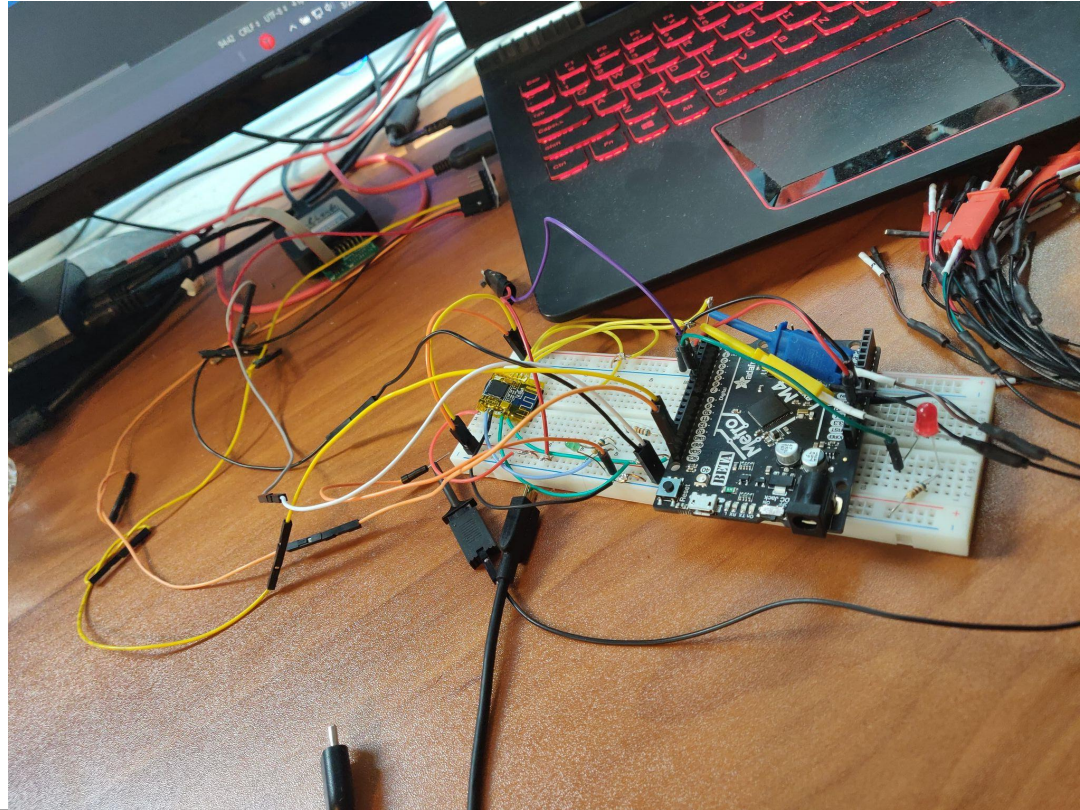
Updated System Specifications

- Sense in range 8-12 Hz

- Have an alarm go off when threshold met for 15 seconds

- Send a message to someone if the event is occurring and alarm has not been disabled within 24 seconds

- Wearable and comfortable wrist strap

- Our SDP budget is the limit to the price of our solution ($500)
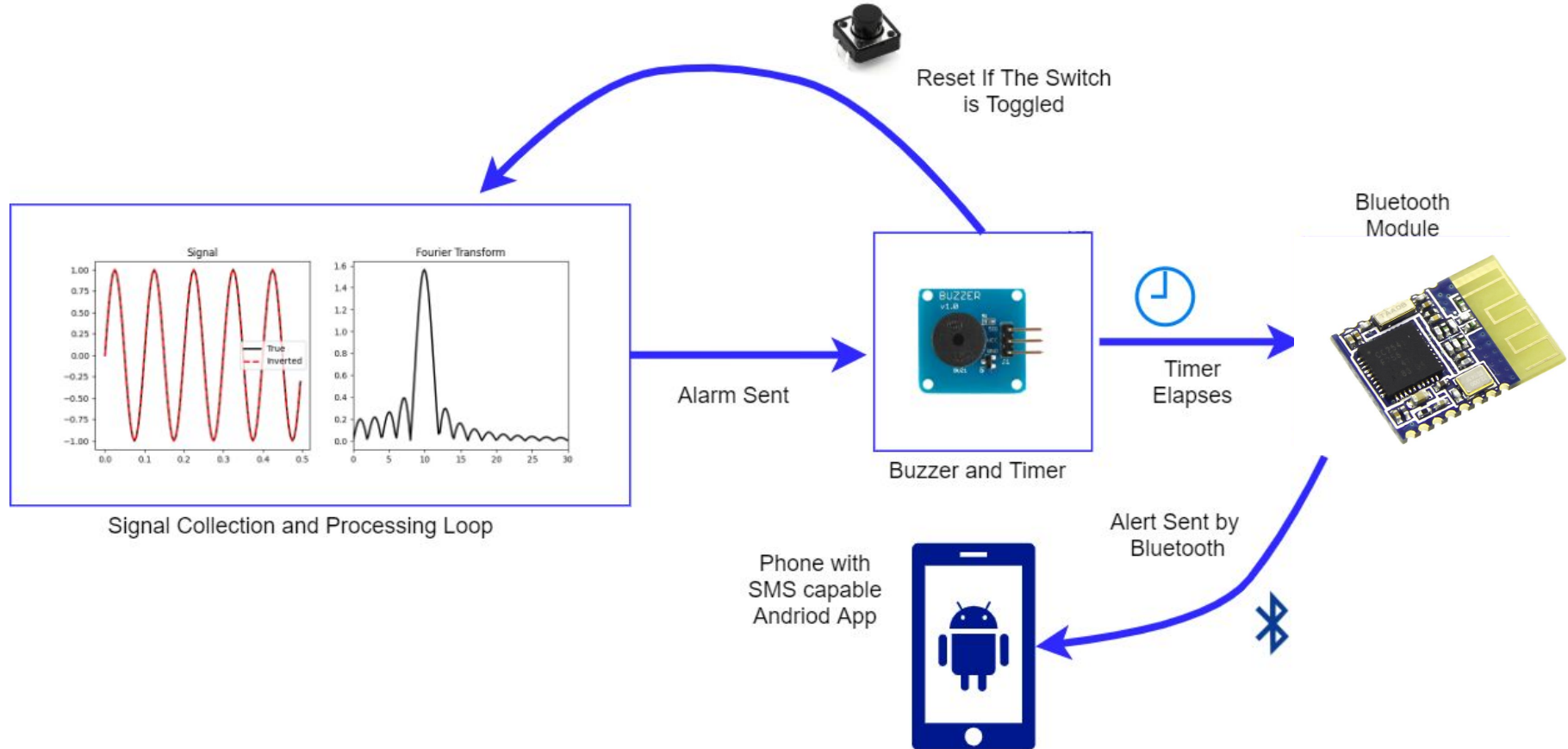
- Multiple day battery life

CDR Deliverables

- Fully functional prototype
  - Detecting shivers
  - Bluetooth Communication with app
  - Send SMS through app
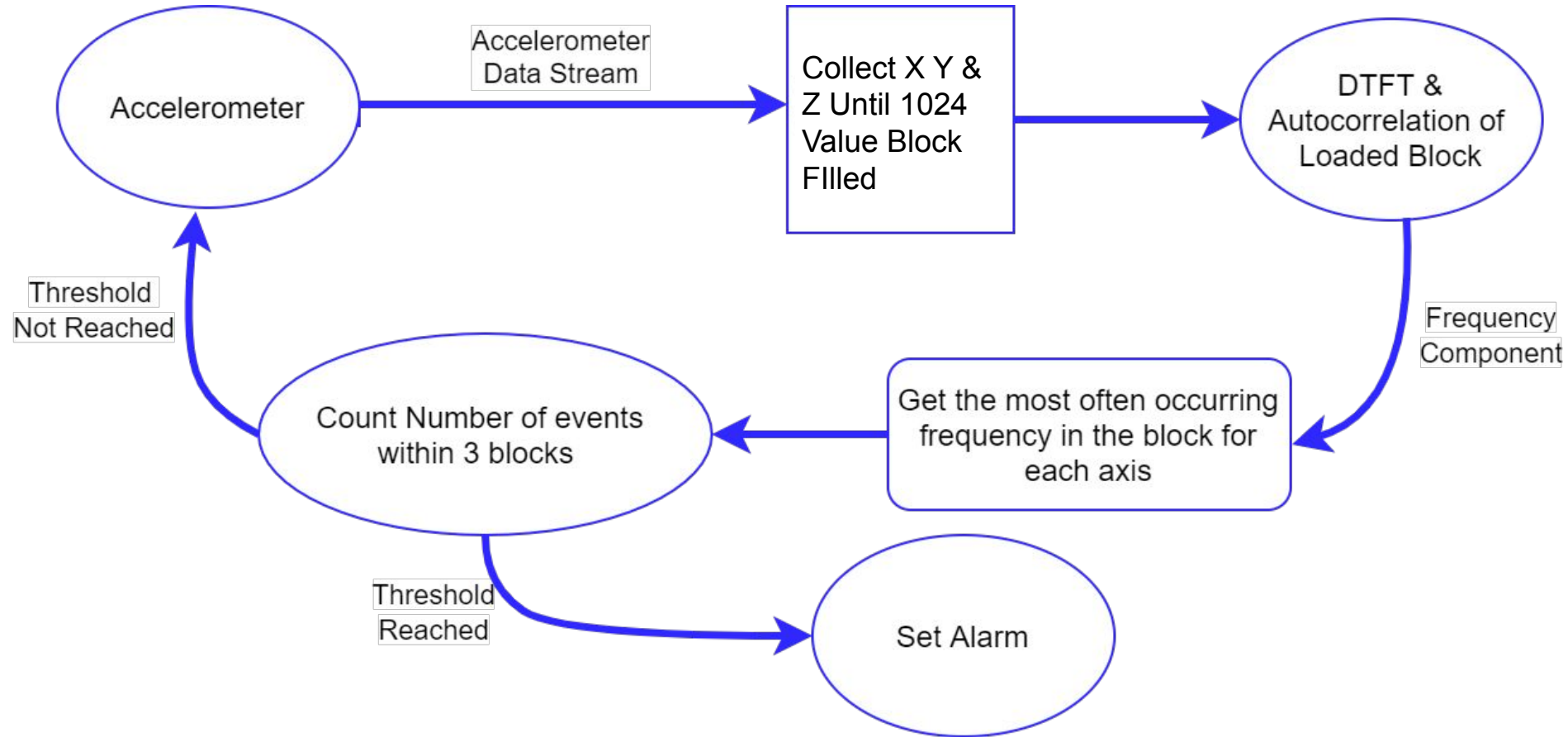 - Log in calendar
  - Alarm reset switch

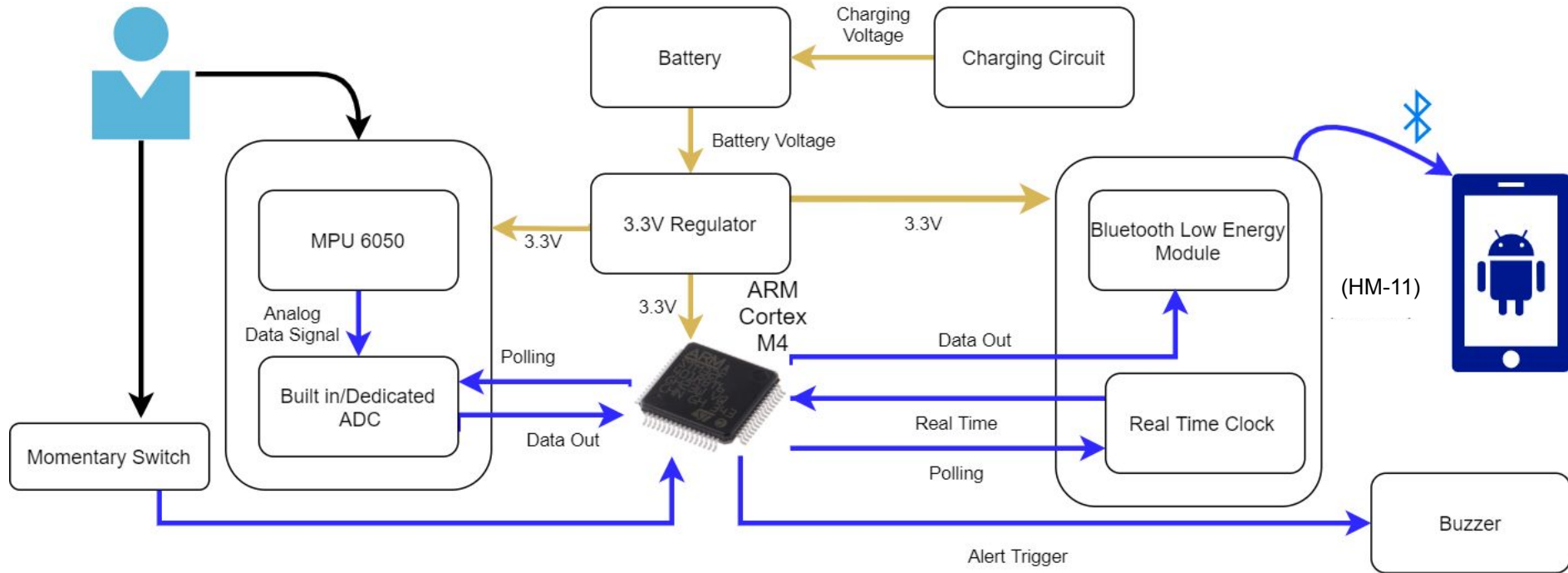# Documentation of Current Prototype

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Updated Overall Design

Reset If The Switch
is Toggled

Bluetooth
Module

Signal

Fourier Transform

True
Inverted

Signal Collection and Processing Loop

Alarm Sent

Buzzer and Timer

Timer
Elapses

Alert Sent by
Bluetooth

Phone with
SMS capable
Andriod App

Updated Signal Processing

Updated Hardware Design

Mike CDR Deliverables

- Source code for FreeRTOS converted to C/C++
- Executable binary for loading directly
- Base C++, software integration with other parts of project

John CDR Deliverables

- Bluetooth module integration on embedded system
- App integration of bluetooth and Improvement of Overall App
- Buzzer functionality (simulated for CDR using standard button and Red LED)
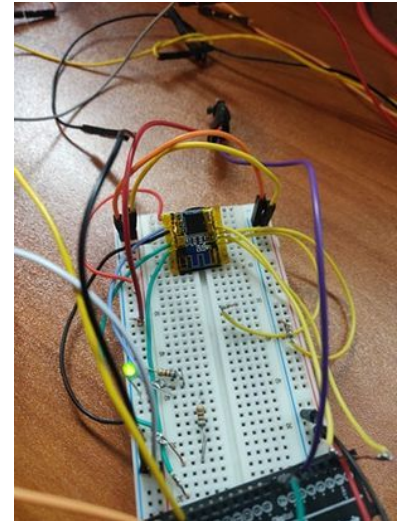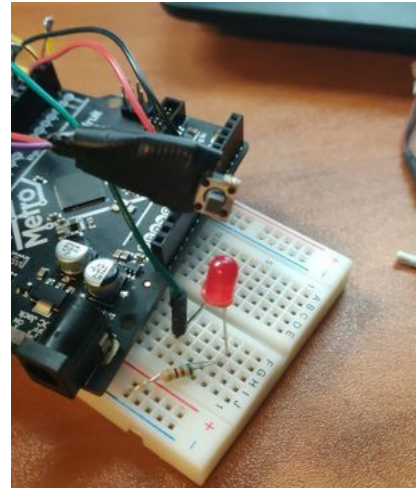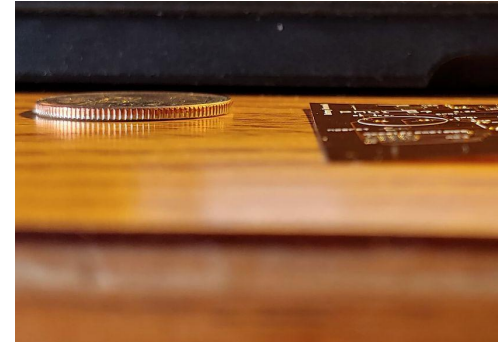
Connor CDR Deliverables

- PCB
  - Finalize design
  - Sent to print
- Schematic
- Parts List/ BOM
  - Find replacements for stock issues
- Assist with calendar integration
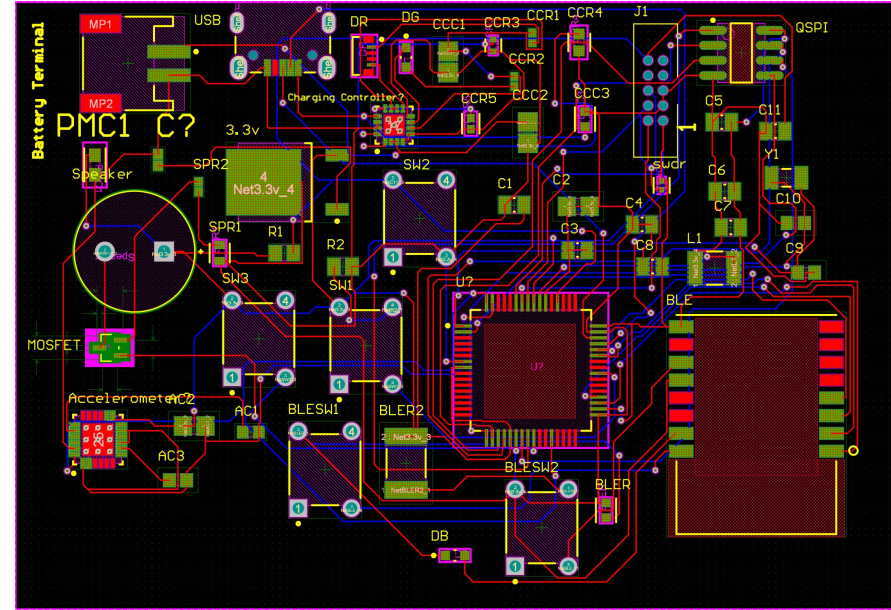
Custom PCB

Schematics

Schematics

Schematics

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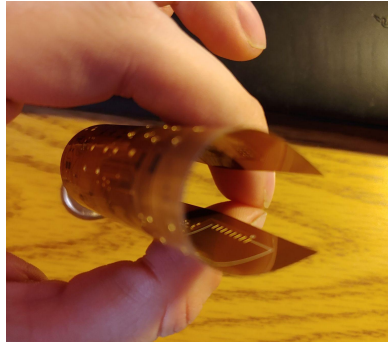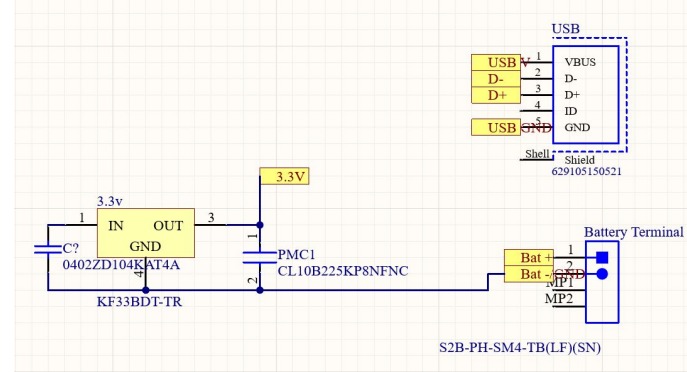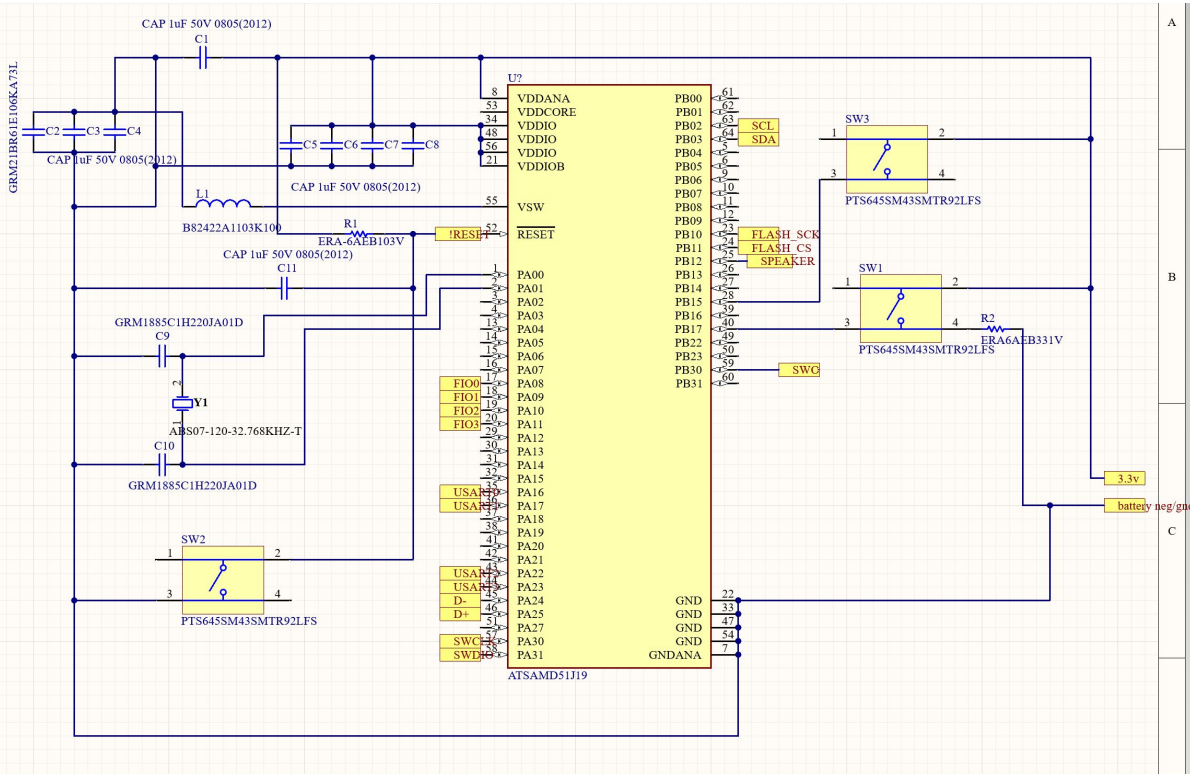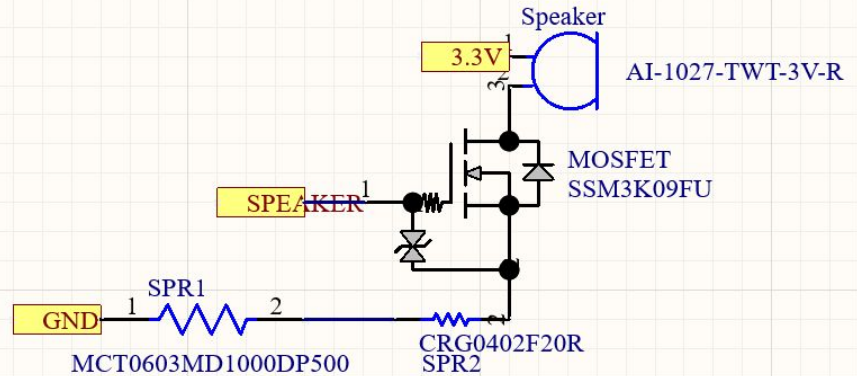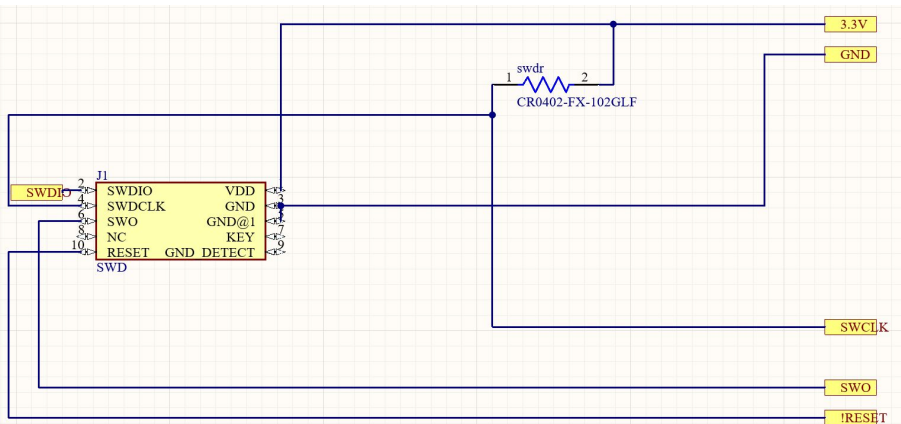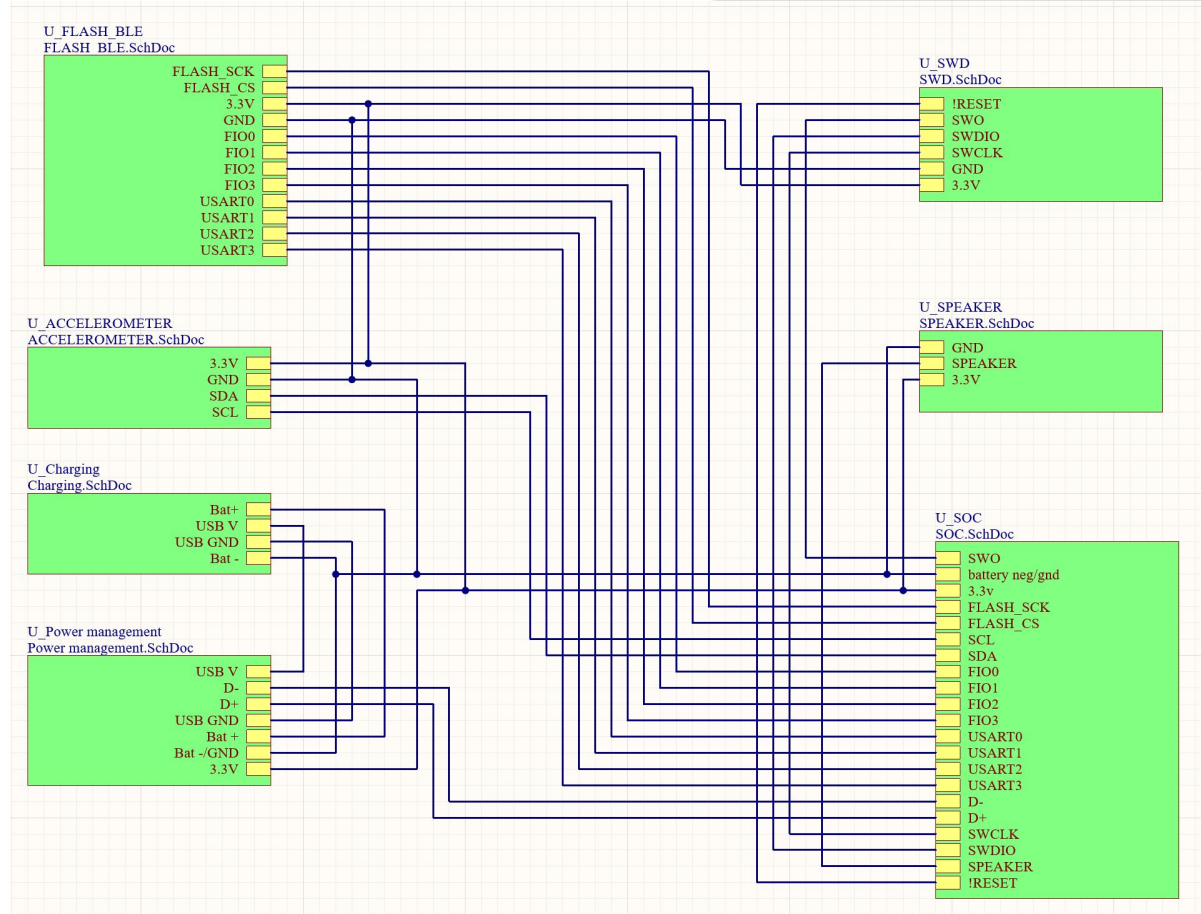
Adam CDR Deliverables

- Sensor calibration and integration into final design
- Program and FFT conversion from python to C++
- Embedded system programming

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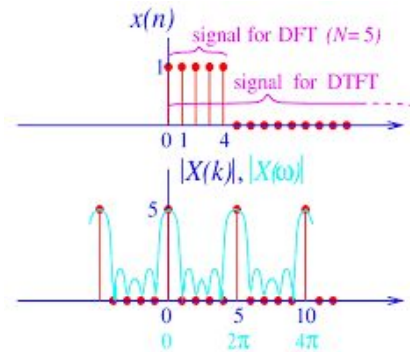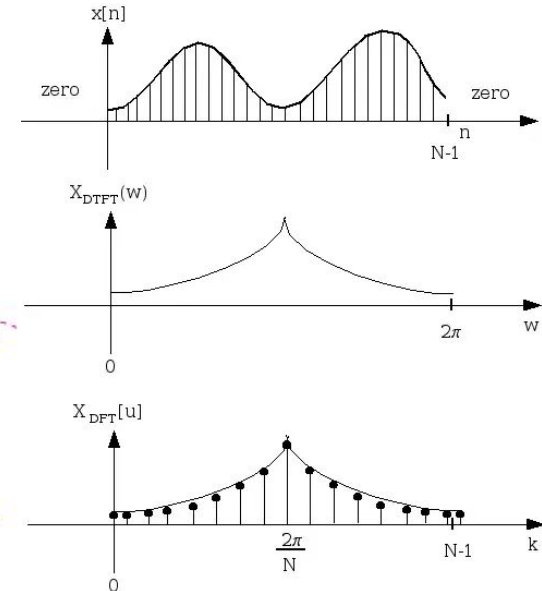
FPR Plan

- FPR version will:
  - have calendar functionality
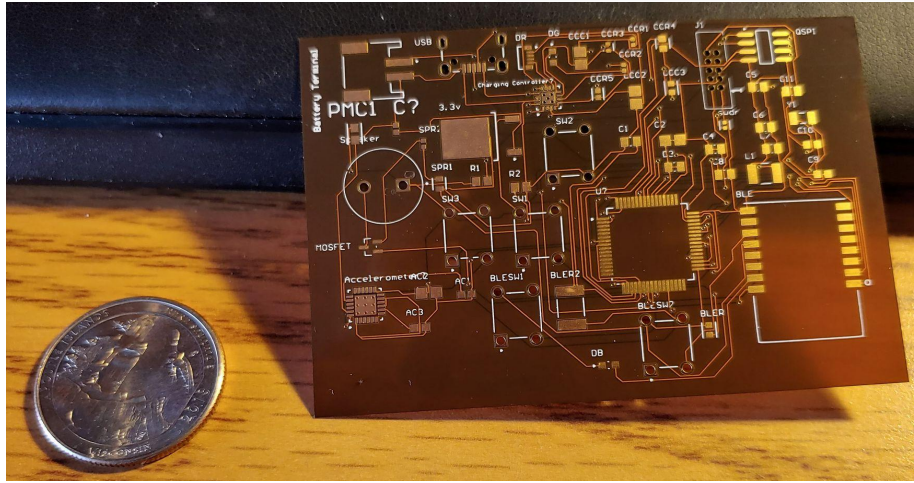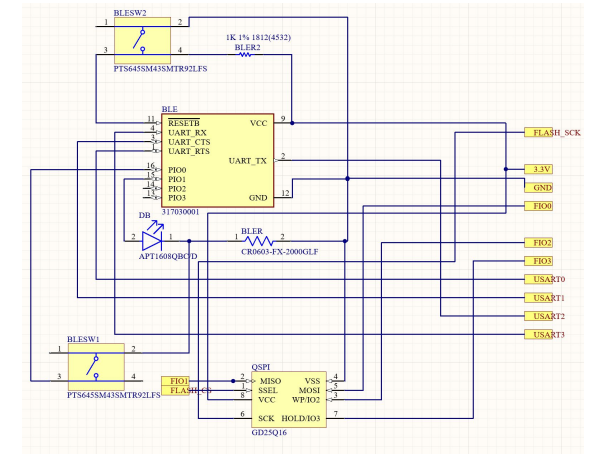 - on custom PCB w/ wrist strap
  - data on power consumption (to meet multi-day spec)
- FPR Demo:
  - consist of video showing shivering and full system response
    - SMS messaging, add event to calendar
    - buzzer and reset button demo
  - Live Demo would consist of a deliberate generation of signals in the target range with full system response
    - Speaker and tapping

Project Management - Gantt Chart

PROJECT TITLE	Shiver-Ring
PROJECT CO-MANAGERS	John Murray & Mike Burton

INSTITUTION	
PROJECT MEMBERS	Michael Burton, Connor Loughman, Adam Maciaszek, John Murray

TASK TITLE	START DATE	DUE DATE	DURATION	TASK COMPLETE	PCB/Port Code			CDR Phase						FPR Final Prep	
					02/01-02/05	02/08-02/12	02/15-02/19	02/22-02/26	03/01-03/05	03/08-03/12	03/15-03/19	03/22-03/26	03/29-04/02	04/05-04/09	04/12-04/17
Administrative Tasks															
CDR Deliverables	2/22/2021	3/31/2021	37 days	90				▉	▉	▉	▉	▉	▉		
CDR Rehearsals	3/27/2021	3/29/2021	2 days	100									▉		
FPR Deliverables	3/15/2021	4/16/2021	32 days	15							▉	▉	▉	▉	▉
FPR Rehearsals	4/12/2021	4/16/2021	4 days	0											▉
Embedded & Software															
Integrate FreeRTOS with Signal Processing	2/1/2021	3/19/2021	47 days	100	▉	▉	▉	▉	▉	▉	▉				
Porting everything to C++/C	2/1/2021	3/19/2021	47 days	100	▉	▉	▉	▉	▉	▉	▉				
Integrate Bluetooth	3/24/2021	03/27/2021	3 days	100								▉			
Final Design Testing	3/22/2021	4/17/2021	26 days	33								▉	▉	▉	▉
Hardware															
PCB design Finalization, Ordering, & Recieving	2/1/2021	3/17/2021	45 days	100	▉	▉	▉	▉	▉	▉	▉				
Cicuitboard Assembly	4/5/2021	4/12/2021	7 days	0										▉	▉
Communication															
Connect Bluetooth Android App	3/24/2021	4/1/2021	8 days	35								▉	▉		

Cost Break Down

Part	Number	Price Each	Price
Bluetooth and Prototyping Parts	4	$ 14.90	$ 59.59
Oshpark Flex PCB	6	$ 20.82	$ 124.90
Oshstencils Stencils	3	$ 17.17	$ 51.52
PCB Parts	5	$ 42.10	$ 210.48
Total			$ 446.49

Project Management - CDR to FPR

- Connor Loughman - Altium Lead, App Dev (Android Calendar Integration), PCB assembly

- Adam Maciaszek - Budget Management Lead, Algorithm Tuning, PCB Coding and assembly

- Michael Burton - Project Co-Manager (Short-Term), PCB coding

- John Murray - PCB assembly, Communication Networking, App Dev (General&SMS), Project Co-Manager (Long-Term)

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Demo Time