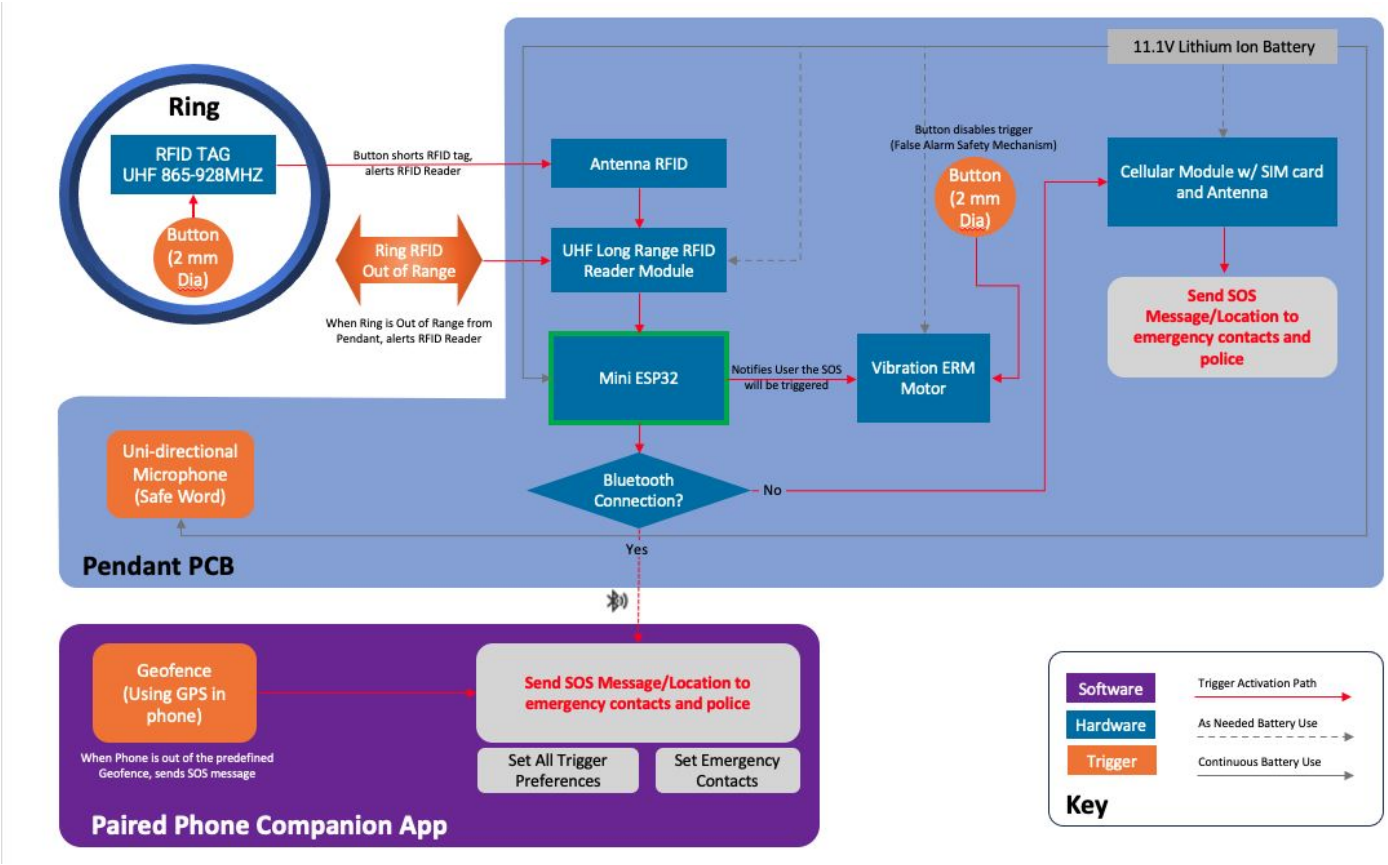
Use Case

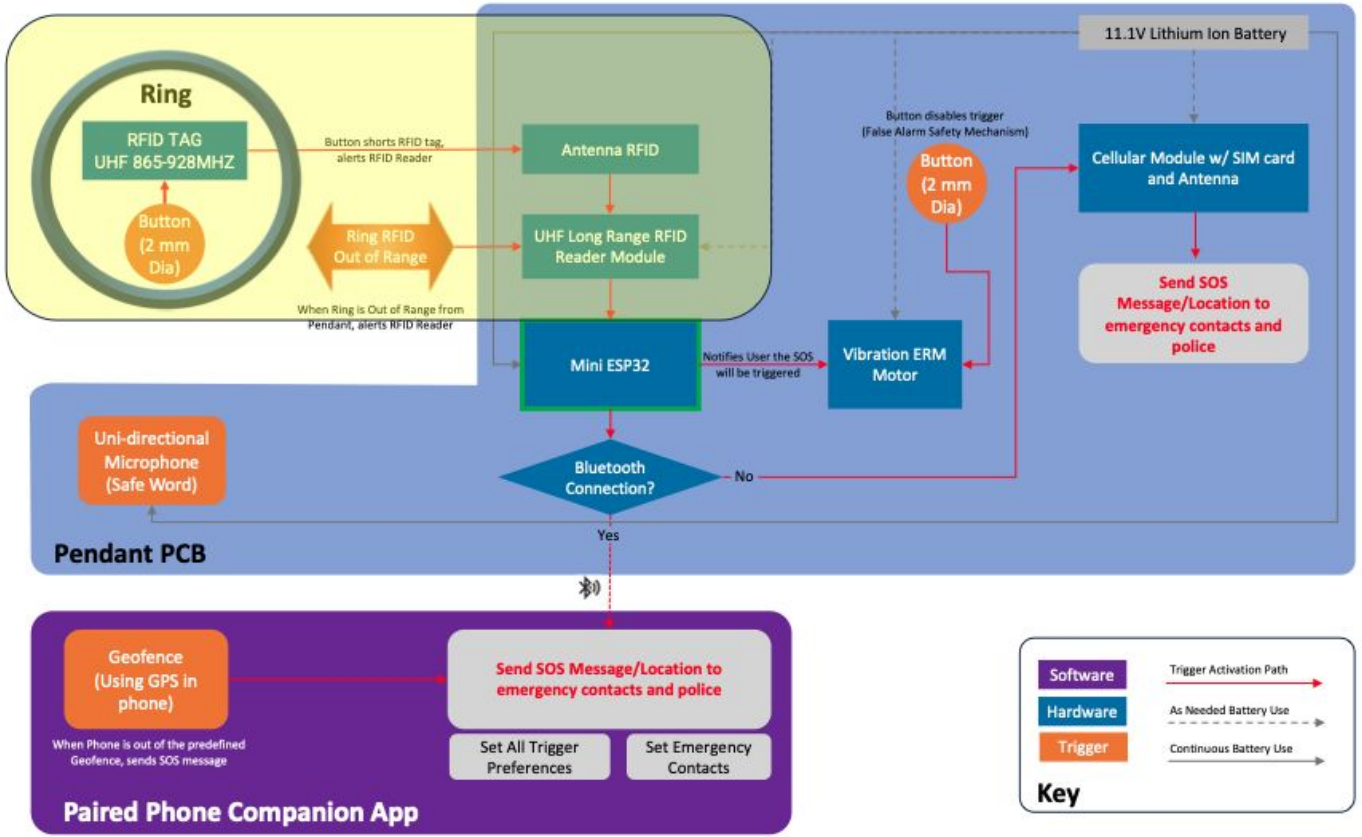
Our Goal: Discreet safety device for immediate response in threatening situations, independent of mobile device availability.

Use Case	**Design Requirement**
Usable even with phone out of reach	Integration of cellular into the pendant tries phone first, then sends directly from pendant
Must be usable for at least 8 hrs, because that's how long a person is generally out of their normal safe area/day	Battery must supply at least 2600mA in order to run for 8 hrs Device consumption must be ~325mA
User doesn't want to send false alarms	Integrate an alert on the companion app with the option to undo a trigger
Alerts must be sent in a timely manner in order to get help ASAP	Messages from the companion app/or pendant must be sent in no less than 15 seconds once approved.
User shouldn't be dependent on just a ring to send a trigger.	Allow for alternatives like audio triggers, or geofencing

Solution Approach Diagram:



Solution Approach Changes:



Public Health, safety welfare, considerations, etc

- This device is made for public health and safety, as it will help people feel safe in public spaces
  - Goal of discreteness so it does not draw attention either
- As a safety device, it is our job to make sure our product is reliable as well as robust
  - False alarm detection
  - User can choose settings that ensure safety for them

Final Solution Approach

What we hope to show in the public demonstration:

- Be able to trigger alerts from both the phone and cellular successfully
- Showcase RFID triggering an alert
- Have an audio trigger implemented
- Allow for the user to receive alert notifications and stop one from sending accidentally
- Geofencing from cellular as well

Testing, Verification and Metrics

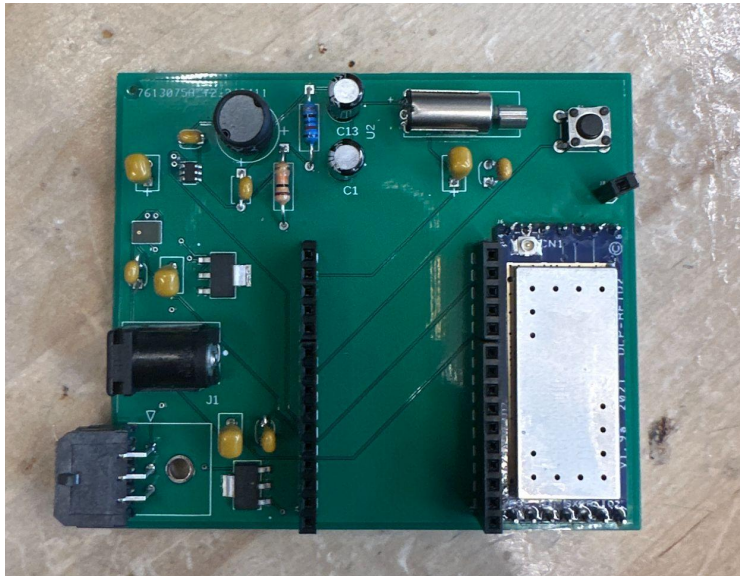
Passing Test Requirement	Metric being Verified	Type
< 10s	Time to switch between BTE and CELL	Use case #1
< 10s	Time for CELL to send SOS	Design Requirement #1
> 8h	Battery life	Use case #2
> 2600 mAh	Battery ability to power for everything for 8h	Design Requirement #2
< 5%	False Alarm Rate	Use case #3
< 5%	Ability to stop false alarms	Design Requirement #3
> 90%	Ring->Pendant link	Use case #4
< 10s	All communication speed	Design Requirement #4
> 1 trigger	Not just one trigger	Use case #5
> 90% all trigger detection	Viability of other triggers	Design Requirement #5

Performance

Passing Test Requirement	Metric being Verified	Testing Outcome	Notes
< 10s	Time to switch between BTE and CELL	~3s	Passed
< 10s	Time for CELL to send SOS	~8s	Passed
> 8h	Battery life	10h	In progress…
> 2400 mAh	Battery ability to power for everything for 8h	-	In progress…
< 5%	False Alarm Rate	-	In progress…
> 1 undo	Ability to stop false alarms	notifies of alert + 10s undo time	Passed
> 90%	Ring->Pendant link	-	In progress
< 10s	All communication speed	5s max between everything	Passed
> 1 trigger	Not just one trigger	(Button for testing) and Geofence triggers	Passed
> 90% all trigger detection	Viability of other triggers	-	In progress…

Trade offs:

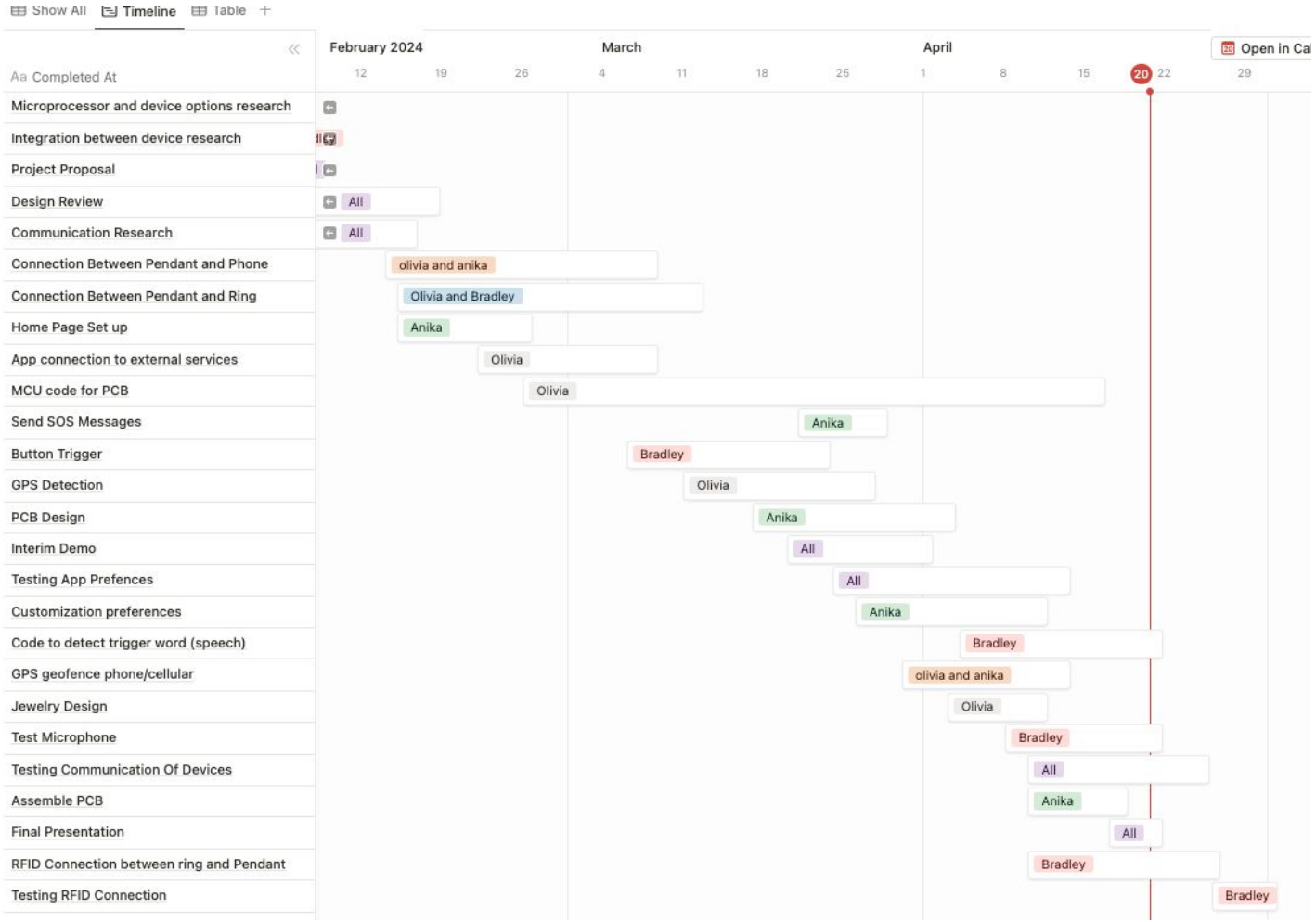
- PCB size
  - Sisterboards
  - Using sisterboards allowed for easier coding integration
  - Increased board size (2.5in x 3 in pendant)
- RFID Trigger Method
  - UHF issue
    - Didn’t receive our UHF reader
    - Used HF but range is significantly lower, had to change approach
- Battery size
  - Result of other tradeoffs
  - Needed large battery to supply all these components



Demo Video: Bluetooth vs no Bluetooth Connection

Demo Video: Geofencing

Gantt Chart


Show All
Timeline
Table
February 2024
March
April
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12
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4
11
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1
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22
29
Aa Completed At
Microprocessor and device options research
Integration between device research
Project Proposal
Design Review
All
Communication Research
All
Connection Between Pendant and Phone
olivia and anika
Connection Between Pendant and Ring
Olivia and Bradley
Home Page Set up
Anika
App connection to external services
Olivia
MCU code for PCB
Olivia
Send SOS Messages
Anika
Button Trigger
Bradley
GPS Detection
Olivia
PCB Design
Anika
Interim Demo
All
Testing App Prefences
All
Customization preferences
Anika
Code to detect trigger word (speech)
Bradley
GPS geofence phone/cellular
olivia and anika
Jewelry Design
Olivia
Test Microphone
Bradley
Testing Communication Of Devices
All
Assemble PCB
Anika
Final Presentation
All
RFID Connection between ring and Pendant
Bradley
Testing RFID Connection
Bradley