BITNG PROJECT UPDATE

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Outline

- Progress to date

- LP ECG

- Schedule
    - Gantt Chart update

- Path forward

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PROGRESS TO DATE

Progress from last week

- LP ECG
  - Firmware development

- IRB Proposal
  - Modification

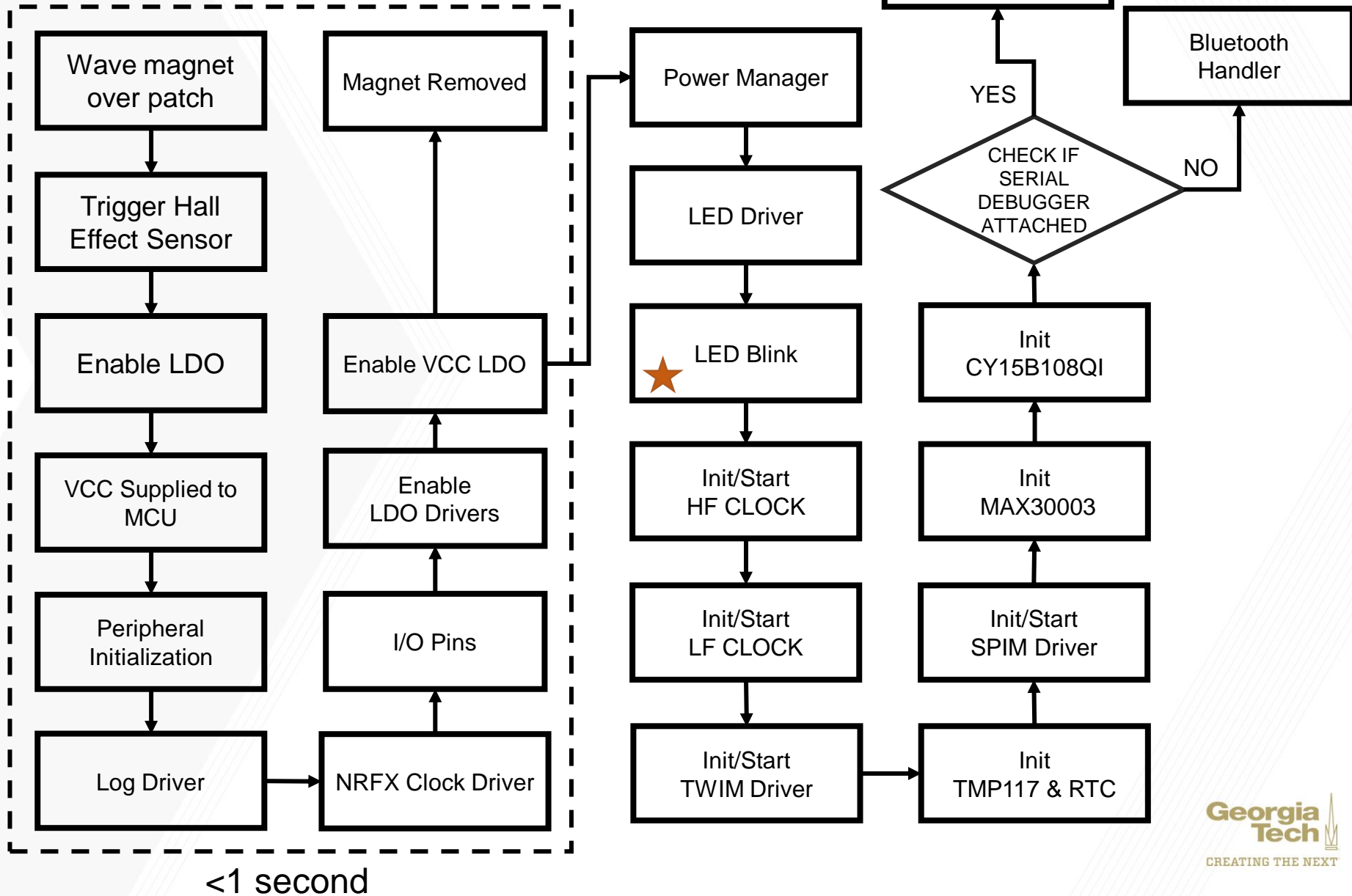# LP ECG PROJECT

Firmware

- ECG
  - ~~MAX30003~~
    - ~~Drivers~~
  - ~~Optimization~~
- FRAM
  - ~~CY15B108QI~~
    - ~~Drivers~~
  - ~~Optimization~~
- NRF52
  - ~~BLE~~
  - ~~Power Optimization~~
  - ~~RTC~~
- Debugging

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GATT Server [ECG Patch]

Service	Characteristic	Data Type	Read/Write	Notification
	Settings	uint8_t [10]	Write/Read	NO
Configuration	Response	uint8_t [2]	Read	Yes
	CRC	uint8_t [2]	Read	Yes
Temperature	Temperature	uint8_t [250]	Read	Yes
ECG	ECG	uint8_t [250]	Read	Yes

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ECG Patch - Wakeup

```
┌─────────────────────────────────────────────────────────────────────────────┐
│  Wave magnet          Magnet Removed                    Power Manager         │
│  over patch                                                                   │
│      │                      ▲                                │                │
│      ▼                      │                                ▼                │
│  Trigger Hall                                              LED Driver         │
│  Effect Sensor                                                │               │
│      │                                                        ▼               │
│      ▼               Enable VCC LDO ──────┐          ★  LED Blink             │
│  Enable LDO                               │                   │               │
│      │                      ▲             │                   ▼               │
│      ▼                      │             └──────────> Init/Start             │
│  VCC Supplied to        Enable                         HF CLOCK               │
│  MCU                    LDO Drivers                           │               │
│      │                      ▲                                 ▼               │
│      ▼                      │                            Init/Start           │
│  Peripheral             I/O Pins                         LF CLOCK             │
│  Initialization             ▲                                 │               │
│      │                      │                                 ▼               │
│      ▼                                                   Init/Start           │
│  Log Driver ──────> NRFX Clock Driver                    TWIM Driver          │
└─────────────────────────────────────────────────────────────────────────────┘
```

Serial Handler

Bluetooth Handler

CHECK IF SERIAL DEBUGGER ATTACHED — YES → Serial Handler; NO → Bluetooth Handler

Init CY15B108QI

Init MAX30003

Init/Start SPIM Driver

Init TMP117 & RTC

<1 second

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Bluetooth Handler

```
Init BLE Stack
      ↓
Init GAP Parameters
      ↓
Init GATT
      ↓
Init BLE Advertising
      ↓
Set BLE Advertising Power
      ↓
Init Connection Parameters → Init Peer Manager
```

```
Init Peer Manager
      ↑
Enable DC/DC Converter
      ↑
Start Advertising
      ↑
Check connection before timeout
   NO ↑          YES →
Shutdown (NO branch up)
```

```
Check connection before timeout
   YES → BLE Connection Established
            ↓
         LED Blink  ★
            ↓
         GATT Client Discovers Services
            ↓
         Subscribe to characteristic notifications
            ↓
         GATT Server writes "Response" Characteristic to "Initialization" Command & Sends Notification
            ↓
         GATT Client changes "Settings" Characteristic
            →
         Change setting or perform action
            FAILURE ↑ → GATT Server changes "Response" Characteristic to report error performing requested operation
            SUCCESS ↓ → GATT Server changes "Response" Characteristic to send request status and sends notification to GATT Client
```

Data Recording Initialization
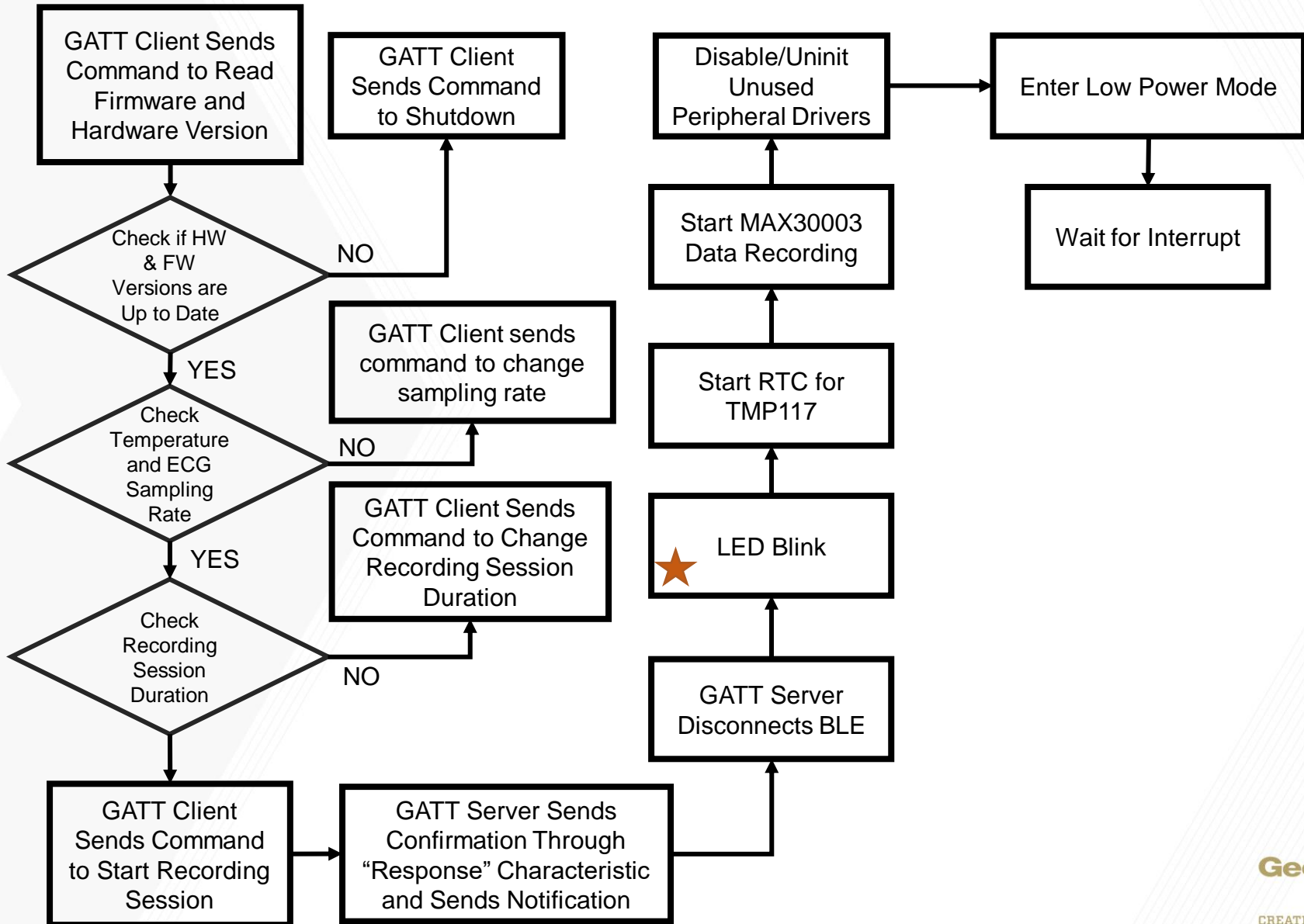
Data Interrupt
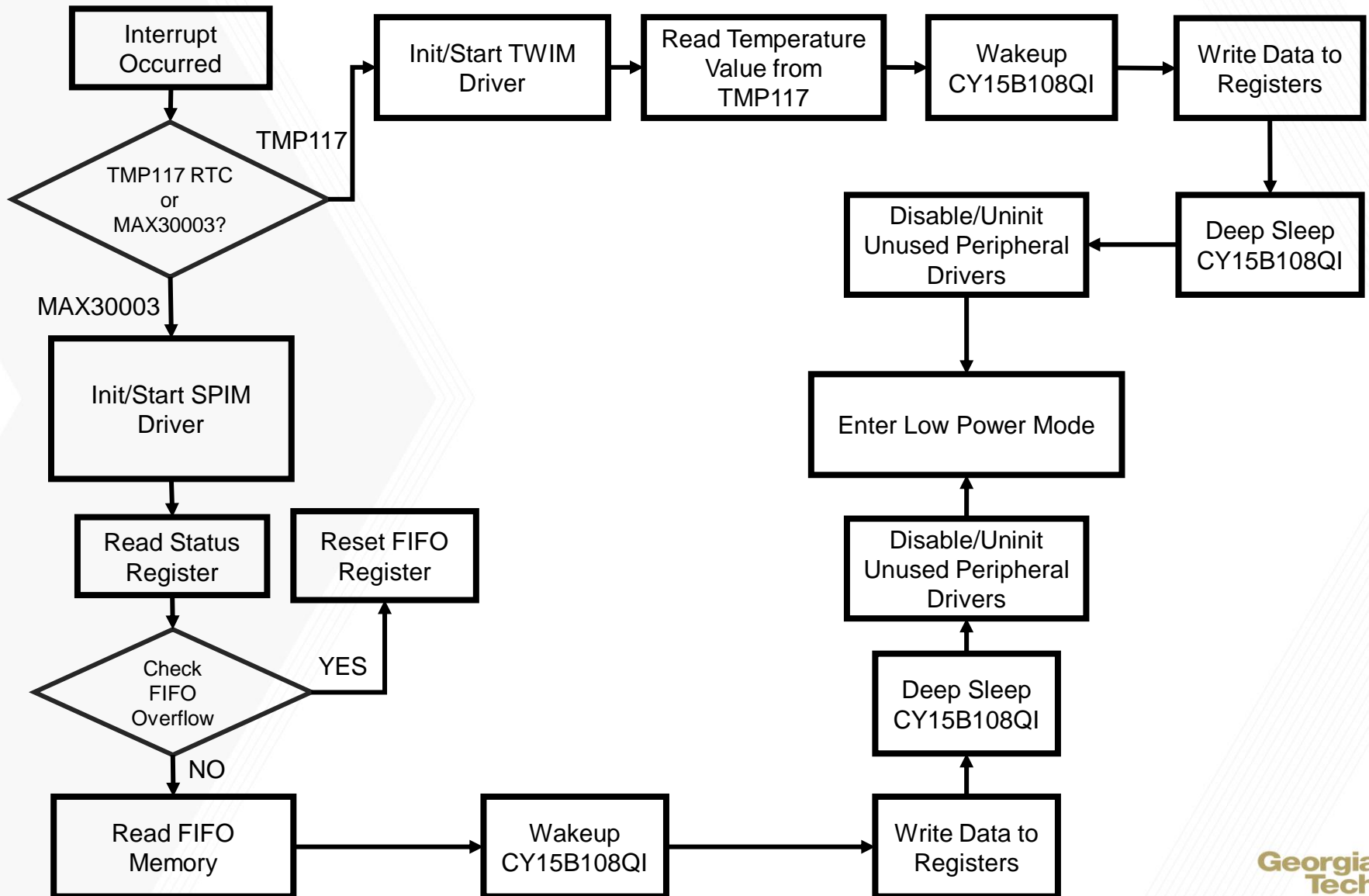
Recording Session Timeout

PATH FORWARD

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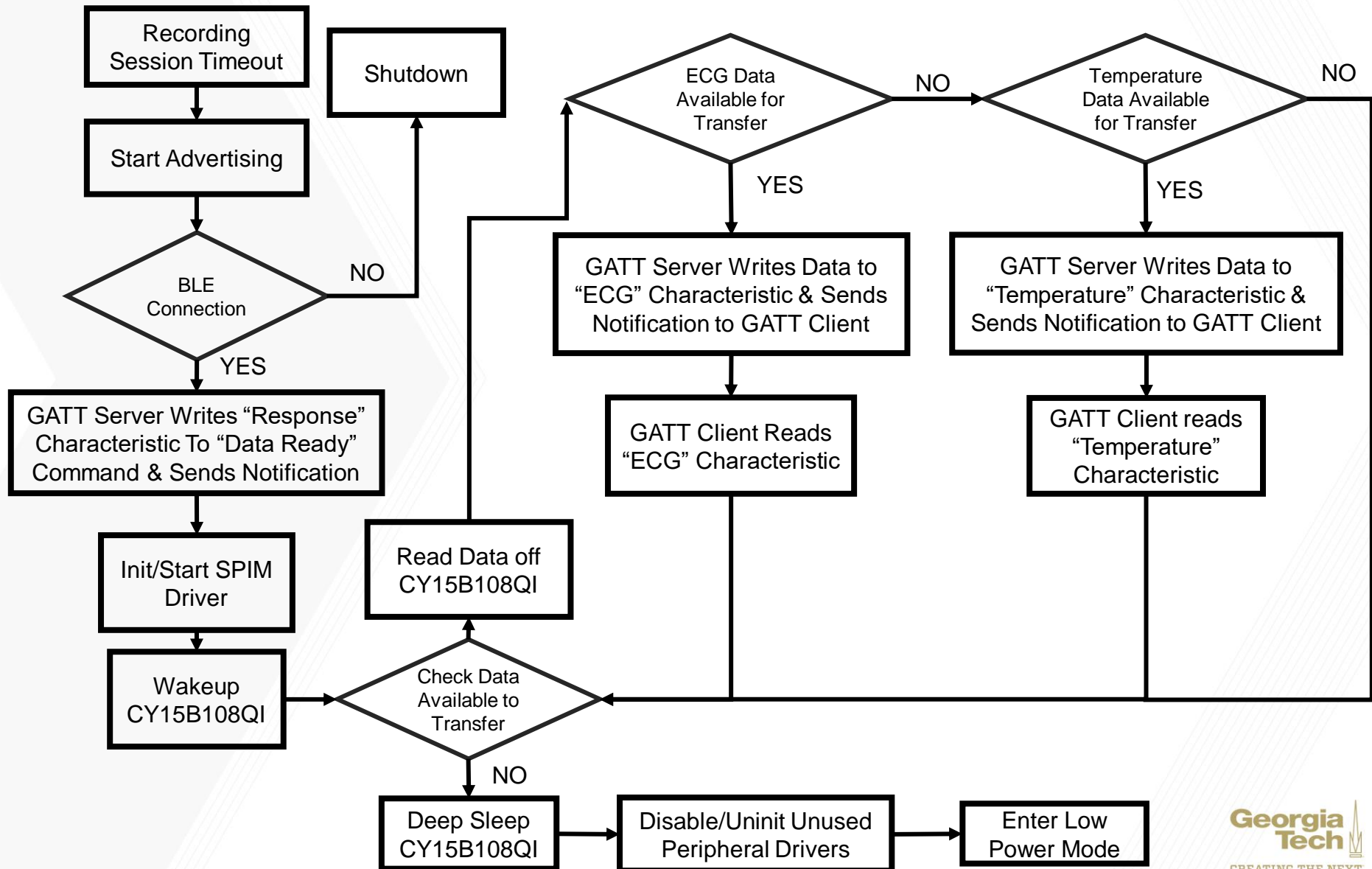
Path forward (12/07/20 – 12/14/20)
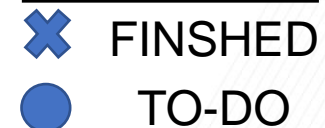
- LP ECG:
    - Firmware development
    - Flexible PCB design

- Shriner's Project:
    - Sensor manufacturing:
        - Strain sensors (2X)
            - Trial #3

SCHEDULE

Schedule Gantt chart

Task	11/23-11/30	11/30-12/07	12/07-12/14	12/14-12/21	12/21-12/28	12/28-1/4	1/4-1/11
LOW POWER ECG							
-PCB ASSEMBLY							
-HARDWARE DEBUGGING							
-FIRMWARE DEVELOPMENT	✖	⬤					
-PCB DESIGN		⬤					
NEUROMOTOR PEDIATRIC WEARABLE							
-LITERATURE REVIEW	✖	⬤					
-PCB ASSEMBLY							
-HARDWARE DEBUGGING							
-FIRMWARE DEVELOPMENT							
-PRESSURE SENSOR MANUFACTURING			⬤				
-STRAIN SENSOR MANUFACTURING		⬤					

LEGEND

✖ FINSHED

⬤ TO-DO

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APPENDIX