Dwight Look College of
ENGINEERING
TEXAS A&M UNIVERSITY

Team 08: Marching Band LPS
Bi-Weekly Update 5

Alex Flores, Vlad Lebedev
Sponsor: Troy Morris, Andrew Morris
TA: Vishwam Raval

Problem Statement & Solution

- **Problem:** Marching bands require very precise positioning for their shows. Currently, the only method of review for marcher positions is a band tower, which is only accessible to the band directors.
- **Solution Proposal:** We are developing a system of wearable transmitters that send signals to stationary receivers for location calculation. This data is then sent to a web application that is accessible to both marchers and the director for a true bird's eye view

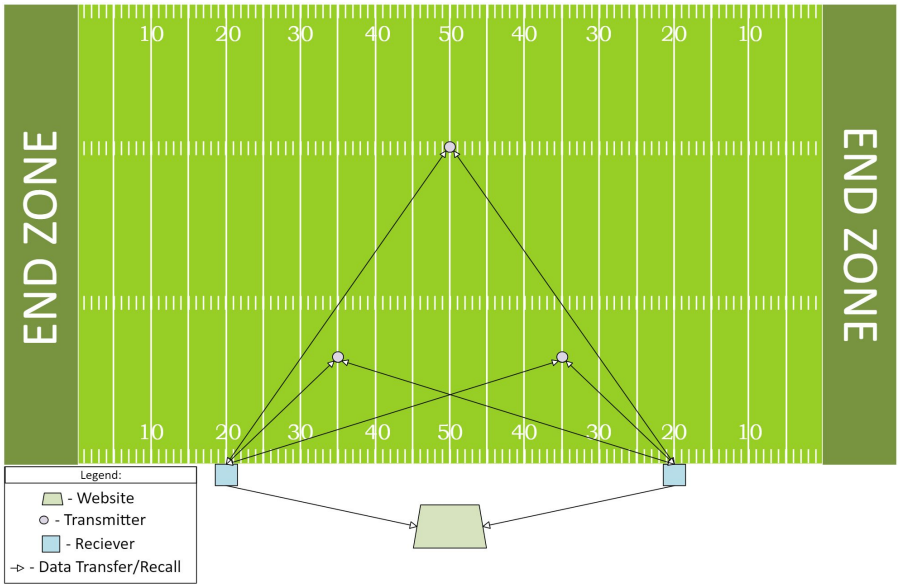
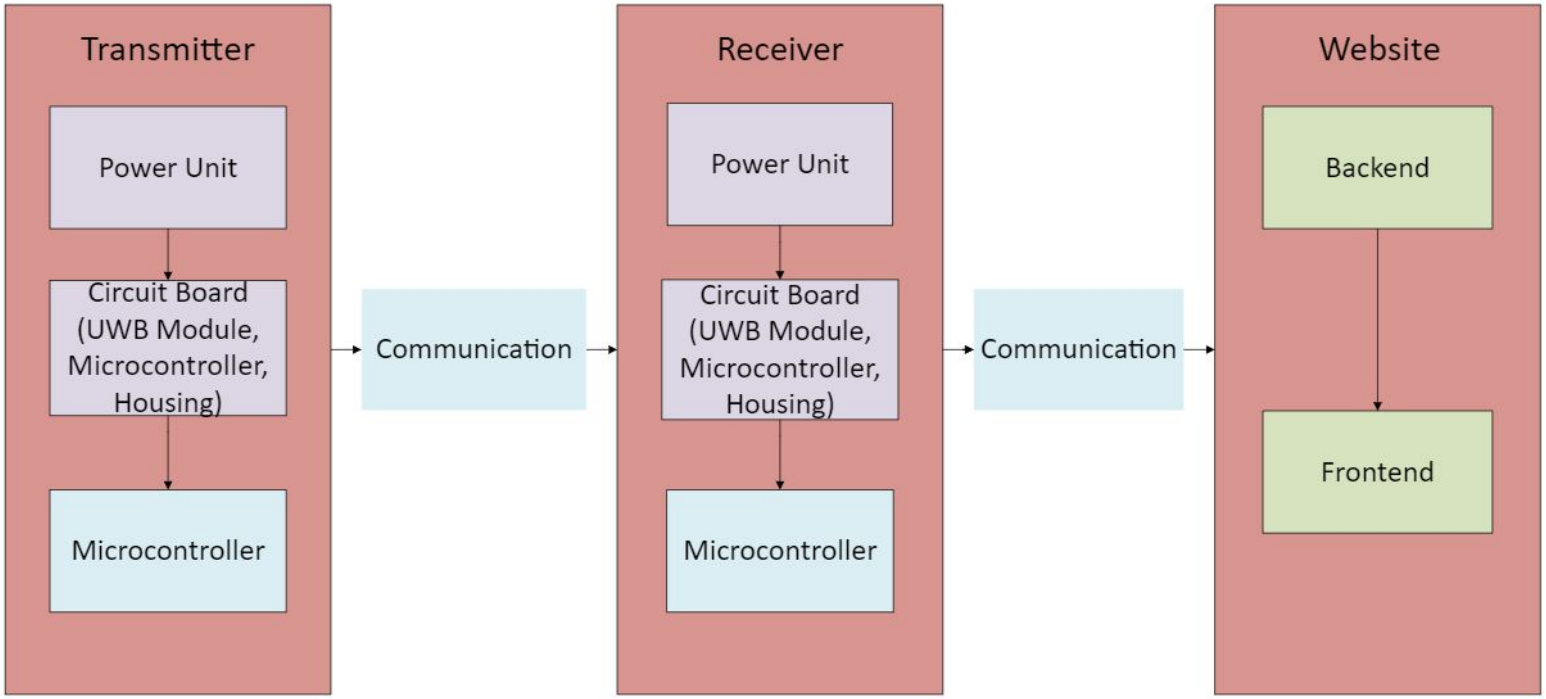
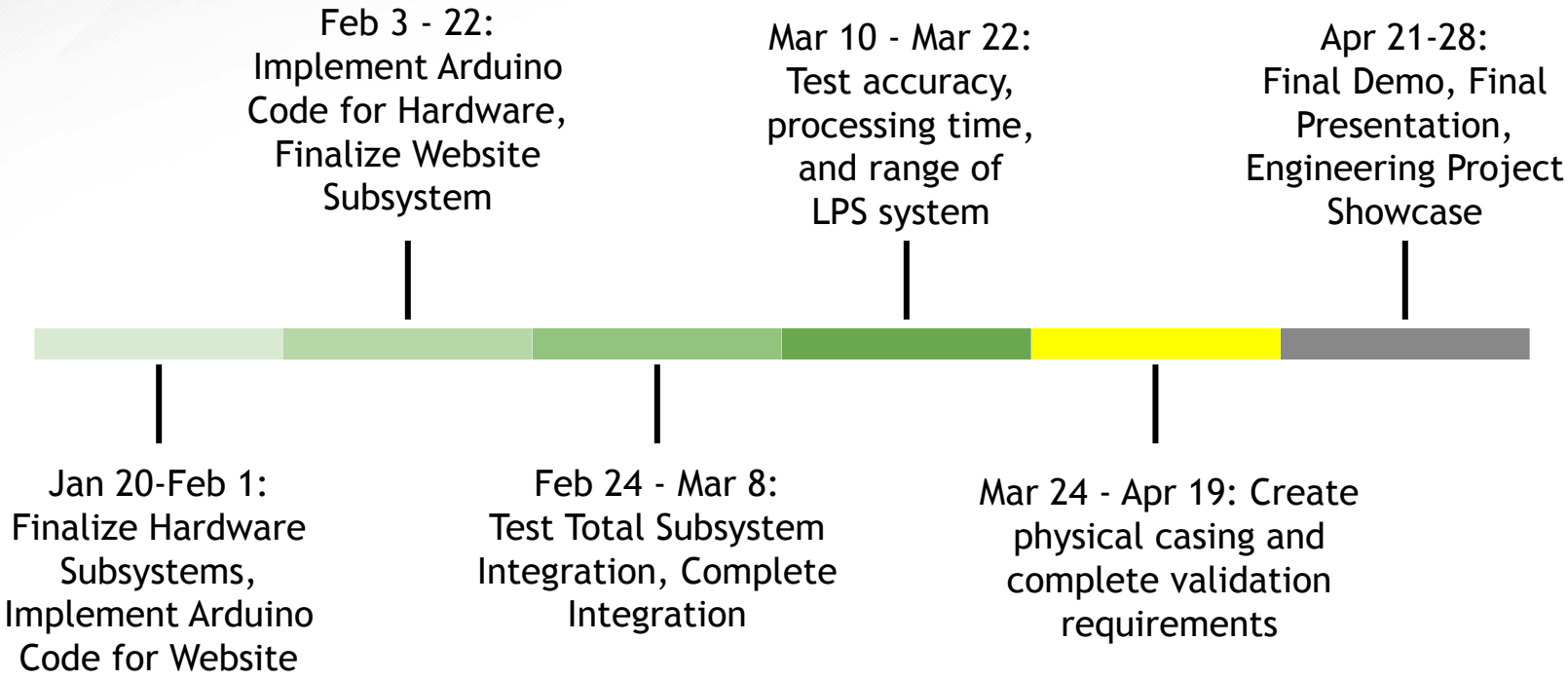


Diagram of Subsystem Division



Project Timeline



Integration Process

Alex Flores

Accomplishments since last presentation 17 hrs of effort	Ongoing progress/problems and plans until the next presentation
Location calculation code completed and tested for precision Accuracy tested and confirmed Range partially tested and confirmed	Finalize range testing Validate physical requirements Show proof of 2 tag operations

Integration Videos

[Link]

	X Value	Y Value			Percent Error X	Percent Error Y
Position 1 Physical	579	365	(19 ft, 12 ft)	Position 1	3.972366149	2.739726027
Position 1 LPS	602	355		Position 2	2.0888014	4.753433209
Position 2 Physical	182.88	320.4	(5 ft, 10.5 ft)			
Position 2 LPS	179.06	335.63				

Integration Process

Vlad Lebedev

Accomplishments since last presentation 12 hrs of effort	Ongoing progress/problems and plans until the next presentation
• Live feed location functionality from device to website • Tested & validated data processing time • Tested & validated accuracy	• Finalize range testing • Validate receiver mounting • Correct the scaling from transmitted data to website data • Final CSS additions on the homepage

Live Feed Functionality

[Link]

Transmitting Speed

```
Mar 21 07:58:20 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:20 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:21 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:21 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:22 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:22 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:23 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:23 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 75 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:24 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:24 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:25 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:25 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:26 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:26 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 75 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:27 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:27 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 75 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:28 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:28 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:29 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:29 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:30 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:30 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:31 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:31 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 76 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:32 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:32 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:33 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:33 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 76 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:34 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:34 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:35 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:35 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:36 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:36 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:37 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:37 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 76 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:38 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:38 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:39 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:39 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:39 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:39 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:40 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:40 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:41 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:41 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:42 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:42 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:43 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:43 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:44 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:44 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:45 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:45 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:46 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:46 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:47 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:47 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 76 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:48 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:48 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:48 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:48 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:49 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:49 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:50 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:50 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:51 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:51 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:52 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:52 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:53 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:53 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:54 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:54 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:55 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:55 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:56 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:56 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:57 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:57 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:57 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:57 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:58 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:58 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:58:59 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:58:59 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:59:00 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:59:00 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:59:01 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:59:01 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:59:02 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:59:02 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:59:03 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:59:03 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:59:04 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:59:04 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
Mar 21 07:59:05 PM  INFO     127.0.0.1 - - [22/Mar/2025:00:59:05 +0000] "POST /BandField/update_positions/ HTTP/1.1" 200 77 "https://marching-band-lps.onrender.com" "ESP32HTTPClient"
```

Execution Plan

Items	Owner	1/27/25	2/3/25	2/10/25	2/17/25	2/24/25	3/3/25	3/10/25	3/17/25	3/24/25	3/31/25	4/7/25	4/14/25	4/21/25	4/28/25
Redesign Board and Order New Parts and Board	Alex														
Bi-Weekly Update #1	Both														
Use Arduino to Create Firmware	Vlad														
Finalize Arduino Details	Both														
Solder New Boards and Test	Alex														
Test Arduino Code Implementation	Alex														
Bi-Weekly Update #2	Both														
Make Changes to Code for Hardware Implementation	Alex														
Finalize Website Subsystem	Vlad														
Bi-Weekly Update #3	Both														
Test Website Connectivity	Vlad														
Finalize Integration	Both														
Test Range of Detection	Both														
Test Precision of Detection	Both														
Spring Break (If needed, catch up if behind)	Both														
Bi-Weekly Update #4	Both														
Participate in Design Blitz	Both														
Implement Design Changes if Needed	Both														
Bi-Weekly Update #5	Both														
Work on Physical Casing	Alex														
Test Physical Properties (Thermal, Weight, etc)	Alex														
Final Presentation	Both														
Final Demo	Both														
Final Report	Both														

Not Started
In Progress
Completed
Behind Schedule

Validation Plan

Paragraph #	Test Name	Success Criteria	Methodology	Status	Owner(s)
3.2.1.1	Location Precision	The Marching Band LPS will be able to provide the location of each marcher with an accuracy of +/- 1 meter.	Establish reference points with known positions and compare LPS data to calculate the precision error.	Tested: Success. Tag was walked around and then its transmitted x and y were compared against real x and y	Full Team
3.2.1.2	Range of Detection	The Marching Band LPS will be able to detect marchers within a football field with the dimensions of 100 meters by 50 meters.	Move around a transmitter at the edges of the football field to ensure stable connection.	Partially Tested: Tag was walked across backyard (~30 yards) and maintained transmission. Want to do full scale soon	Full Team
3.2.1.3	Website Data Process Time	Location data will be processed and displayed on the website associated with the Marching Band LPS in one second or less.	Add a timer on the display and count the time it takes to process 50 location coordinates.	Tested: Success. Connected to website and confirmed over 50 data logs in under 50 seconds (47 seconds)	Full Team
3.2.1.4	Website Connection	The website will connect through WiFi to the receivers.	Be able to network through a local connection like a hotspot from one device on the python project.	Tested: Success. Connected to WiFi and displayed successul connection message	Vlad Lebed
3.2.2.1	Mass	The total mass of the PCB and additional hardware will not exceed 1kg.	Measure mass of the hardware with a digital scale.	Partially Tested: Board is small, which leads me to assume casing will be compact enough to meet mass requirement	Alex Flores
3.2.2.2	Volume Envelope	The housing unit for the PCB will not exceed the dimensions of 80 x 80 x 160 mm.	Perform measurements on the hardware to ensure it fits into specified dimensions	Partially Tested: Board is small, which leads me to assume casing will be compact enough to meet volume requirement	Full Team
3.2.2.3	Receiver Mounting	The receiver can be mounted onto a pole similar in scale to that of a speaker stand. The transmitter can be mounted comfortable onto a person	The receiver will be mounted onto a stand and shaken lightly to ensure stability. The transmitter will be worn by and individual who will move to test comfortability	UNTESTED	Full Team
3.2.3.1.1	Power Consumption	The maximum peak power of the system shall not exceed 2 watt hours	Use mulitmeter to validate watt hours for the device	Tested: Success. Totally draw required is 0.78 Wh when adding up current draw from various parts	Alex Flores
3.2.3.1.2	Input Voltage Level	The input voltage level for the Marching Band LPS shall be within 3.0V-3.5V.	Use mulitmeter to validate input voltage levels	Tested: Success. Output is 3.25V	Alex Flores
3.2.4.2	Thermal	The system should be operational in environments that have temperatures within the range of 10°F and 120°F	System will be placed in a heating device and cooling device and be monitored to guarantee operation in the respective conditions	Tested: Success. Heat was simulated by an oven. Cooling was simulated by being placed in a freezer	Alex Flores

Thank You!