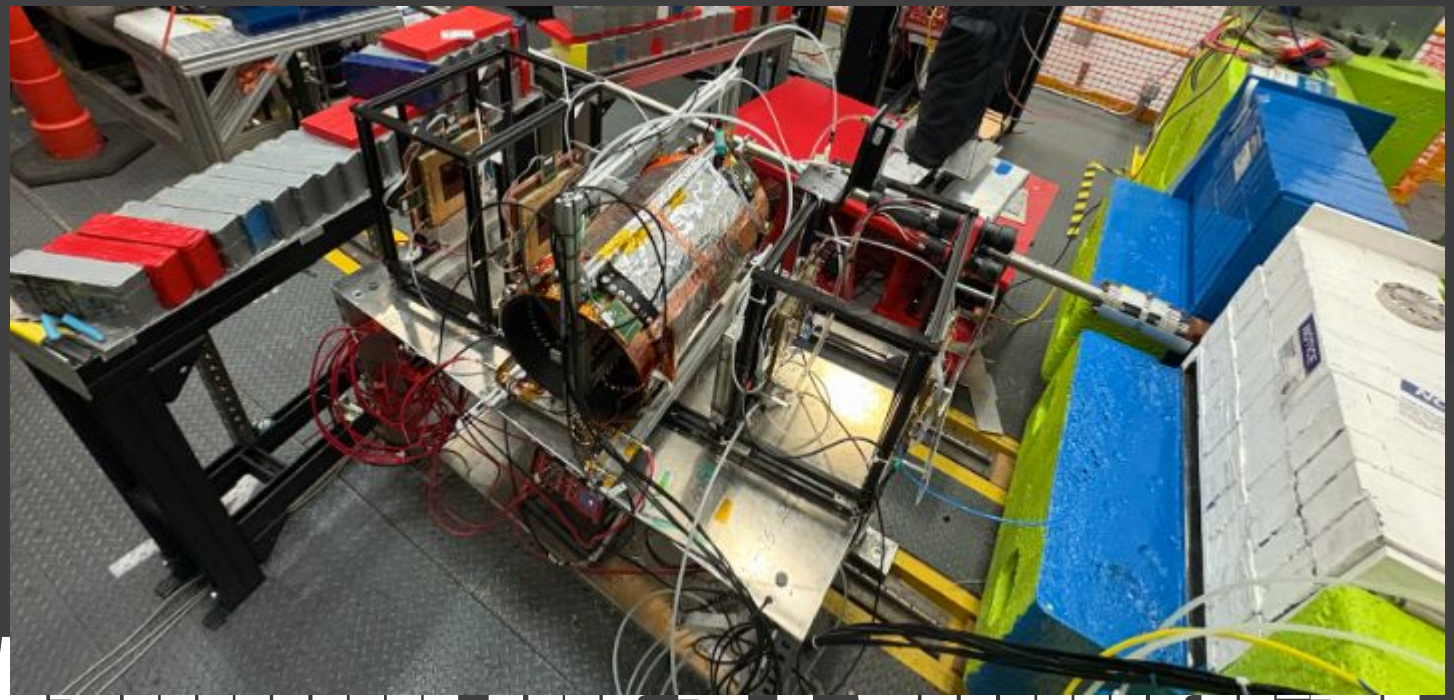

Mapping for a Cylindrical Micro-Resistive Well Detector

Semester 1 Project Plan

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People

Group Members

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Faculty Advisors/Clients

- Pietro Iapozzuto, piapozzuto2015@my.fit.edu
- Dr. Marcus Hohlmann, hohlmann@fit.edu

Goal and Motivation

The goal for the project is to create a program that characterises the efficiency and resolution for the cylindrical micro resistive well detector. The motivation for the project is to provide support for the software integration so the data can be more easily visualized and analyzed by the physicists.

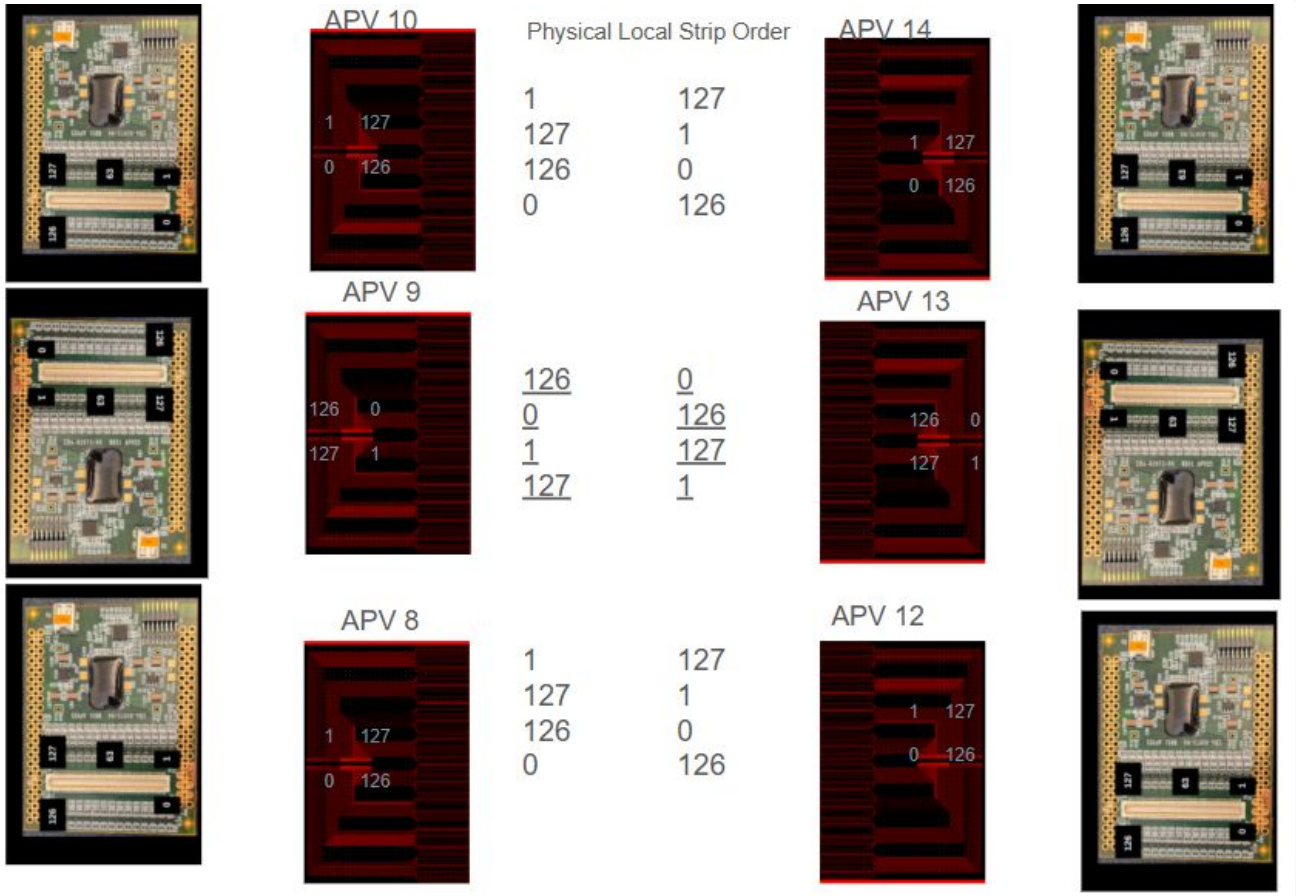
Approach

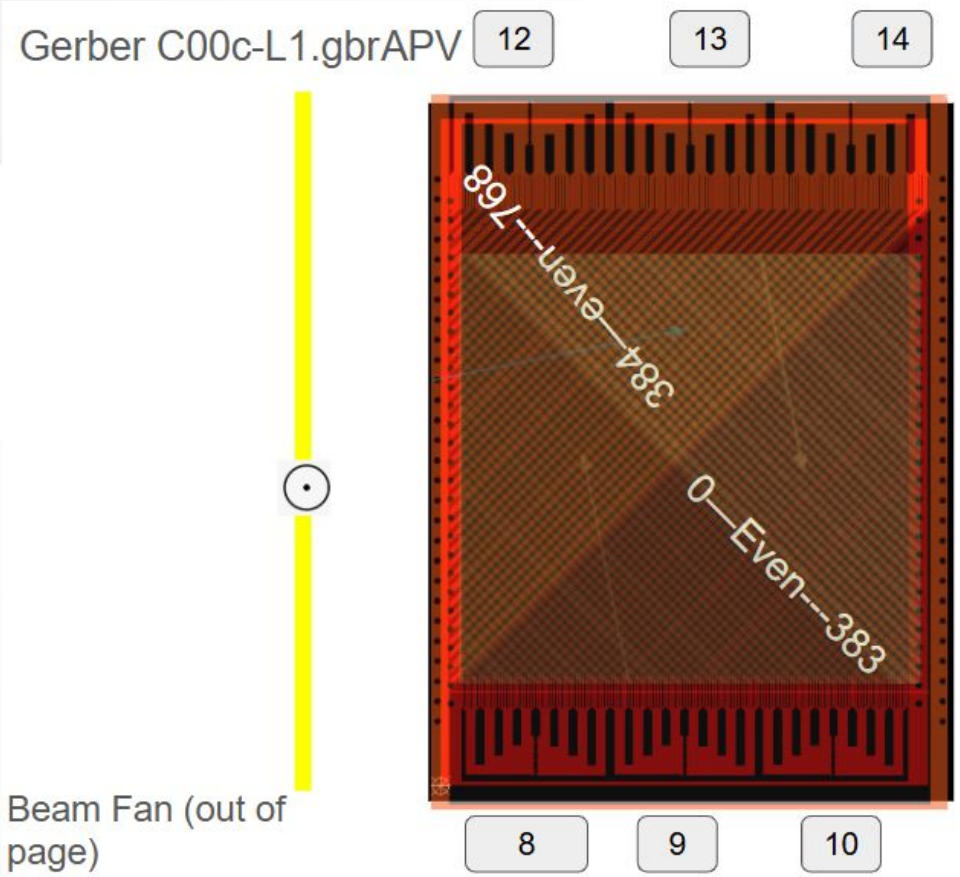
- Establish APV mapping for ROOT file representation
- Automate pipeline for resolution plot generation
- Automate pipeline for efficiency plot generation

Approach- APV Mapping

- ROOT file is a program used to store the massive amounts of data collected by all the detectors.
- The cylindrical micro resistive well detector has six APV chips each with 128 channels.
- Each of the channels are classified two ways:
  - globally, by the order in which they appear
  - locally, by the orientation of the particular APV chip
- Essentially, we need an efficient method for updating the channel representation without losing or affecting the existing data.

Approach- APV Mapping





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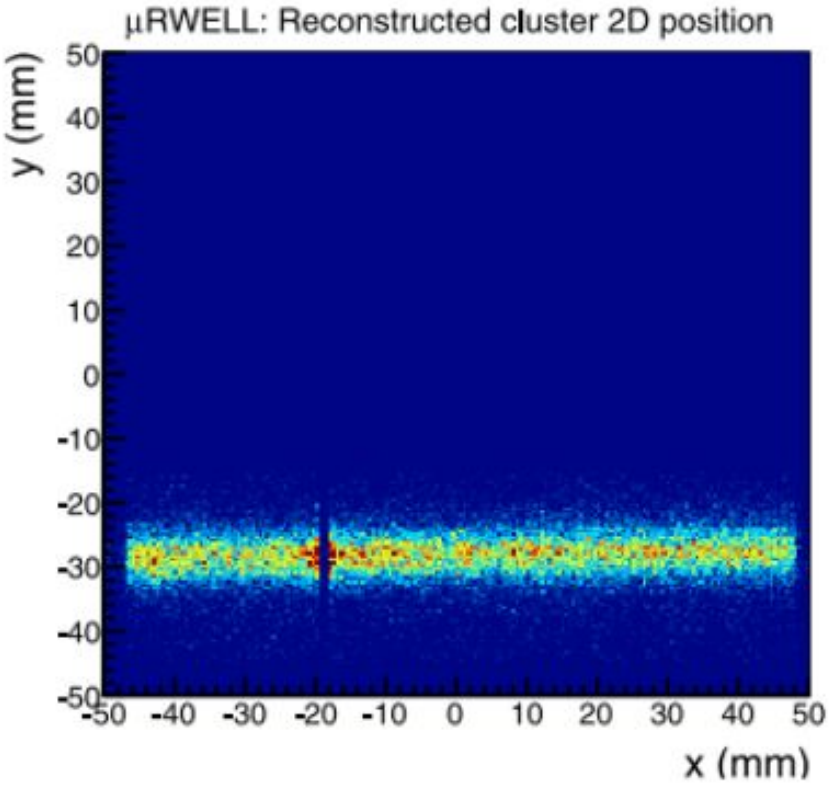
Approach- Resolution Plot

- We will use the channel information from the updated ROOT file to reconstruct the 2D hit positions.
- The resulting beam will be displayed in a clear visual representation.
- These resolution plots will use color and/or depth to illustrate the current levels.



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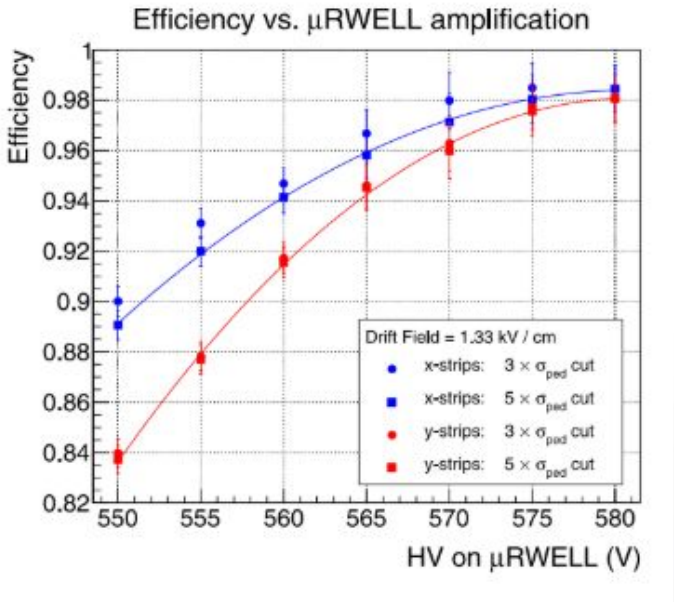
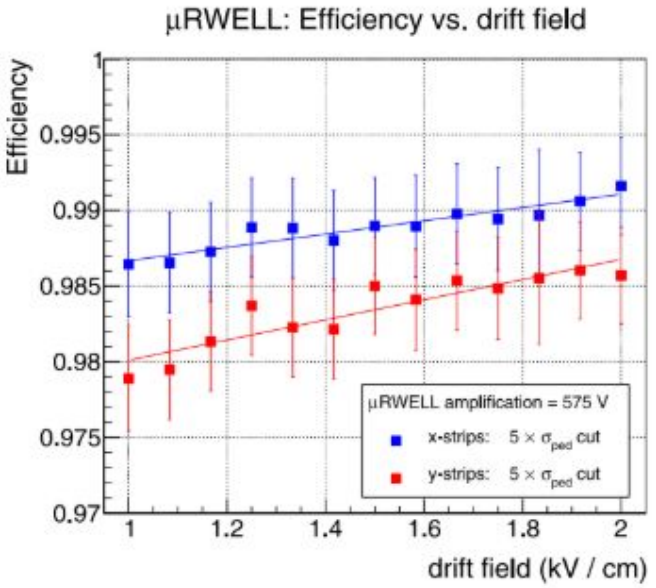
Approach- Efficiency Plot

- Efficiency is used to evaluate the correctness of the cylindrical detector compared to the four other detectors in identifying the hit positions.
- We will automate a pipeline to calculate the efficiency.
- Our plots will compare against other performance characteristics at the request of our clients.





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Novel Features

- Streamlined ability to take multiple beam data files
- Application of the correct pin to physical strip mapping despite nontrivial orientation
- Visualization of electron cluster location on the detector
- Thorough, detailed efficiency and resolution analysis

Algorithms and Tools

- C++: previous codebase
- Python: new codebase
- ROOT: physics analysis library for C++ and Python
- AMORE-SRS tools: framework for online monitoring of the particle data

Technical Challenges

- We have to use the ROOT library, but we haven’t used ROOT.
- We have to use AMORE-SRS tools, but we haven’t used AMORE-SRS tools.
- It is an interdisciplinary project and the content is particle physics so we need to spend more time bridging our knowledge gap in the background of the project.

Milestone 1

- Reading academic journals related to the previous work that's been done on micro resistive well detectors
- Comparing and selecting collaboration tools for software development, documents/presentations, communication, and task calendar
- Downloading and investigating the current software programs used in processing the data files (Merrick's GRADE program)
- Resolve technical challenges relating to ROOT library and AMORE tools

Milestone 2

- Resolving the ROOT file representation to account for corrected global and local channel classifications
- Optimizing the data storage and access to prepare for analysis
- Getting a beam reconstruction fan shape for the cylindrical data
- Proving proper alignment of the trackers and cylindrical detector by matching strip/cluster data

Milestone 3

- Using the channel data to reconstruct the 2D hit positions
- Automating the generation of resolution plots to display the positions
- Using the data to calculate the efficiency ratio
- Automating the generation of efficiency plots against other relevant performance characteristics

Milestone 1 Task Matrix

Task	Alejandro	Summer
Read Academic Articles related to the project	Read *Construction and Beam Test of a Low-Mass GEM Detector with Large Area* and Summarize	Read *Performance of a resistive micro-well detector with capacitive-sharing strip anode readout* and Summarize
Resolve technical challenges	Learn ROOT library	Learn AMORE-SRS TOOLS
Compare and select Collaboration Tools	Programs, Documents, Website	Communication, Task Calendar, Presentations
Requirement Document	Write 50%	Write 50%
Design Document	Write 50%	Write 50%
Test Plan	Write 50%	Write 50%
Investigate GRADE Program	Investigate 50%	Investigate 50%

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Thank you for listening

Questions?