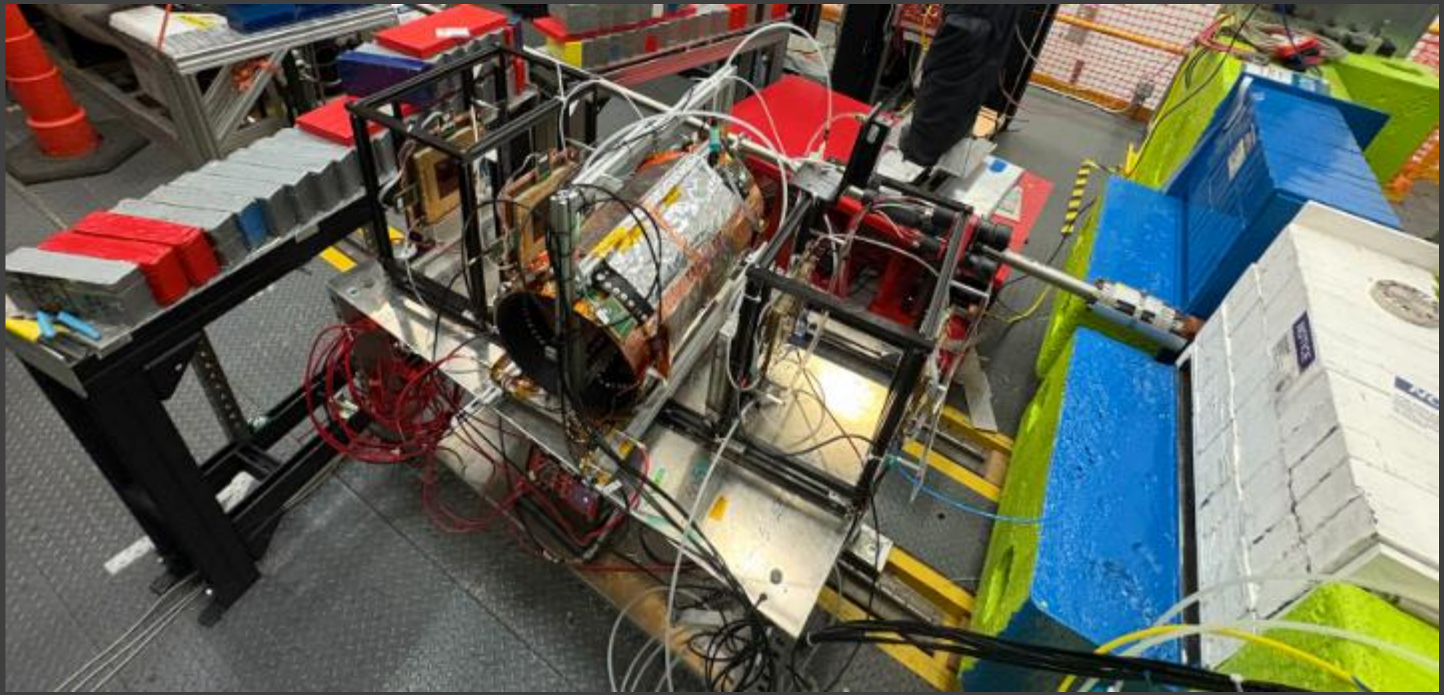

Mapping for a Cylindrical Micro-Resistive Well Detector

Milestone 1

People

Group Members

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Faculty Advisors/Clients

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Milestone 1 Task Matrix

Task	Completion	Alejandro	Summer	TO DO
1. Read Academic Articles related to the project	80%	40%	40%	Always more to read on the background of the project but have acquired a good foundational understanding
2. Requirement Document	100%	0%	100%	Complete
3. Design Document	100%	100%	0%	Complete
4. Test Plan	90%	45%	45%	Complete
5. Investigate software tools (ROOT and AMORE-SRS)	70%	40%	30%	Investigate how AMORE-SRS generates the root file
6. Demo Plots for the Trackers	50%	20%	30%	Generate resolution plots for the trackers by reconstructing their physical positions

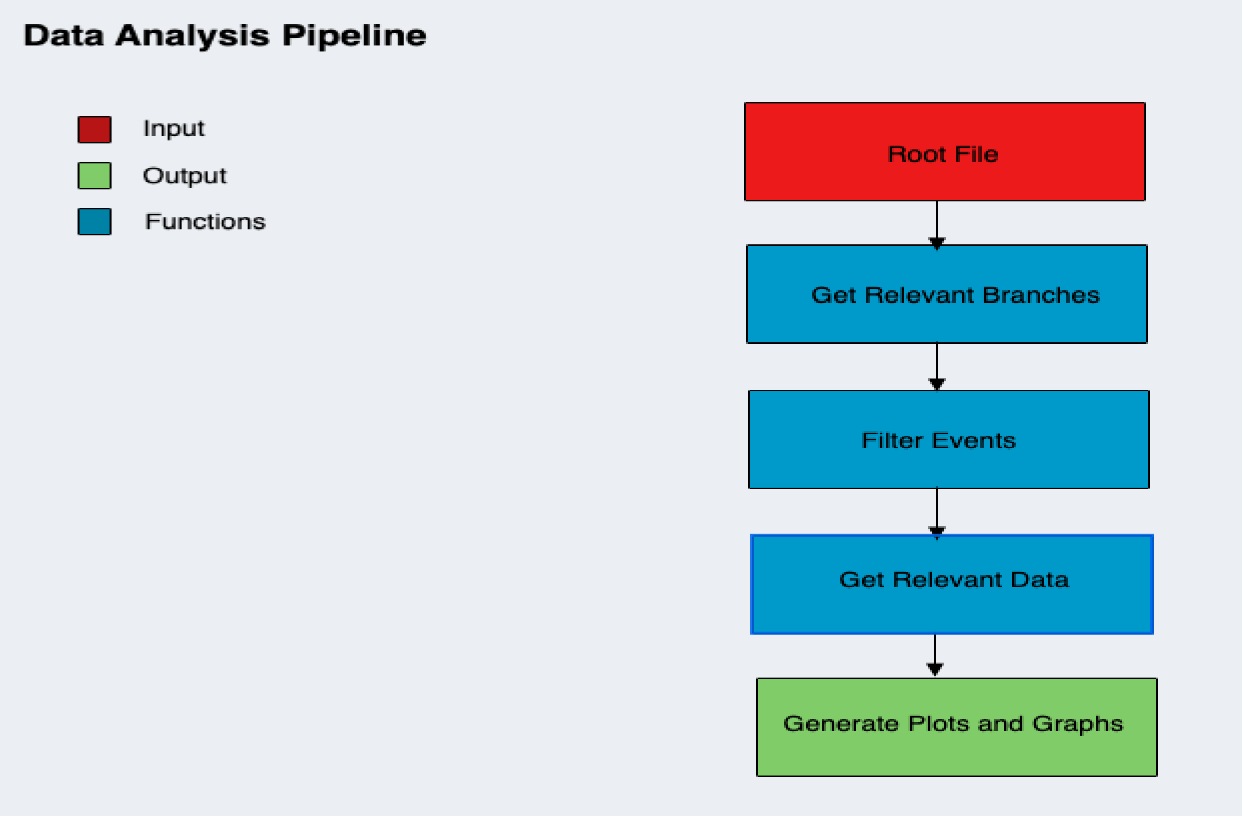
Task- Read academic Journals

- [1] K Gnanvo, N Liyanage, B Mehl and R Oliveira, Performance of a resistive micro-well detector with capacitive-sharing strip anode readout. Nuclear Instruments and Methods (2022).

- [2] M Lavinsky, J Hadley, M Hohlmann and A Zhang, Construction and Beam Test of a Low-Mass GEM Detector with Large Area. Nuclear Instruments and Methods (2025).

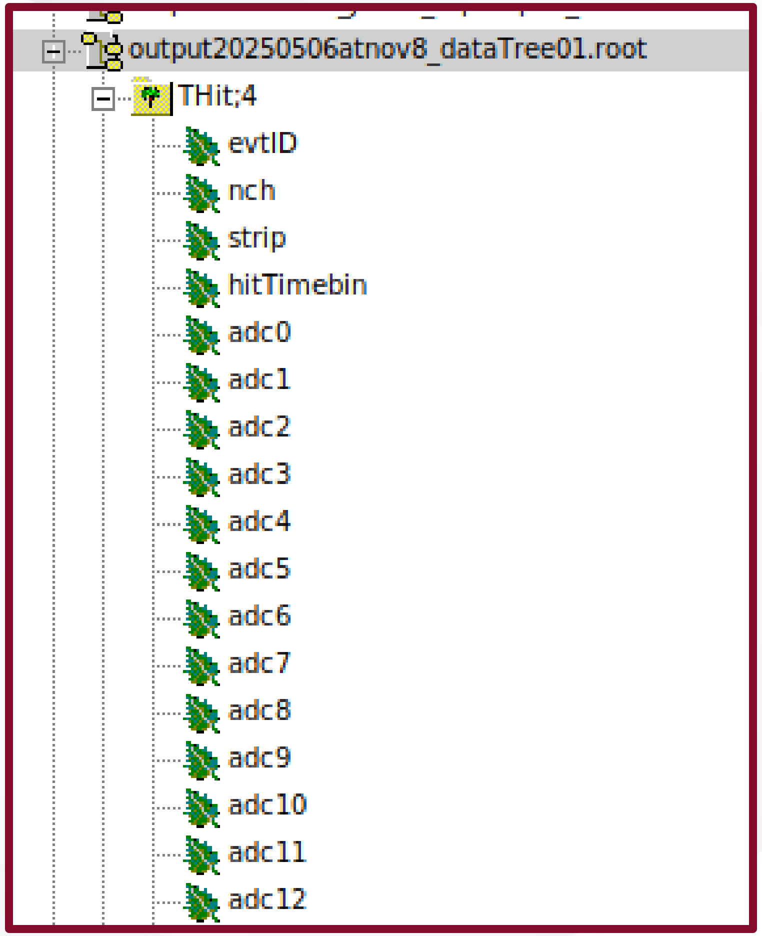
Task- Documents

- Requirements document
- Design document
- Test document



Task- Investigate Software Tools

- ➢Root file structure
- Root analysis interface
- AMORE-SRS



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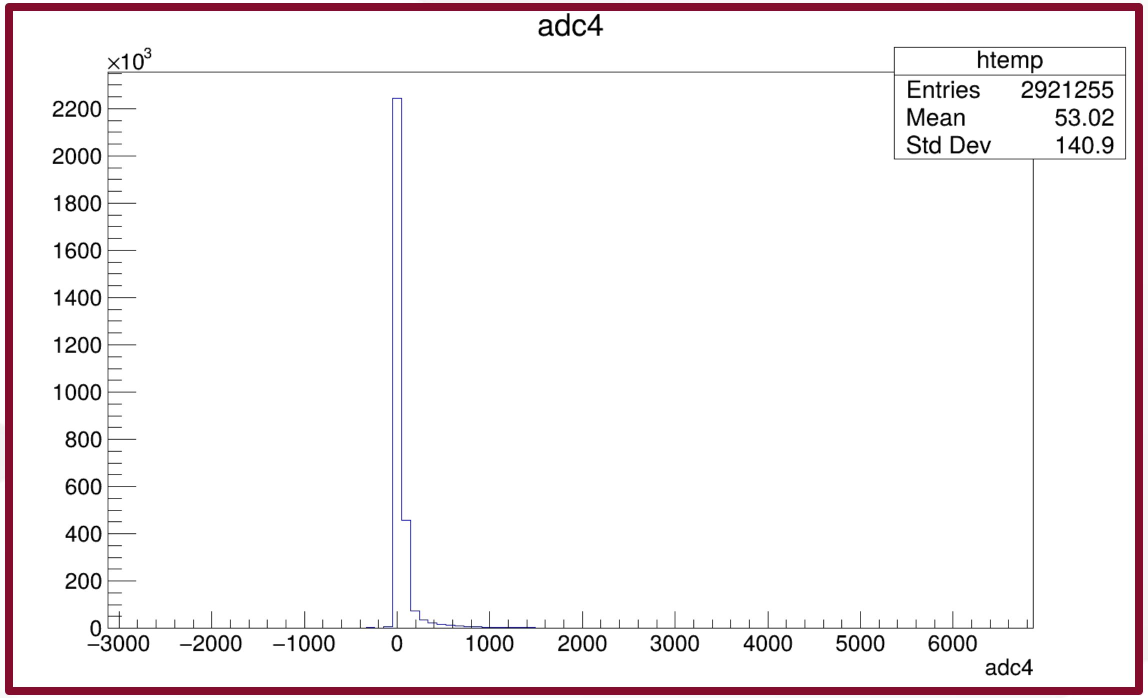
Task- Investigate Software Tools

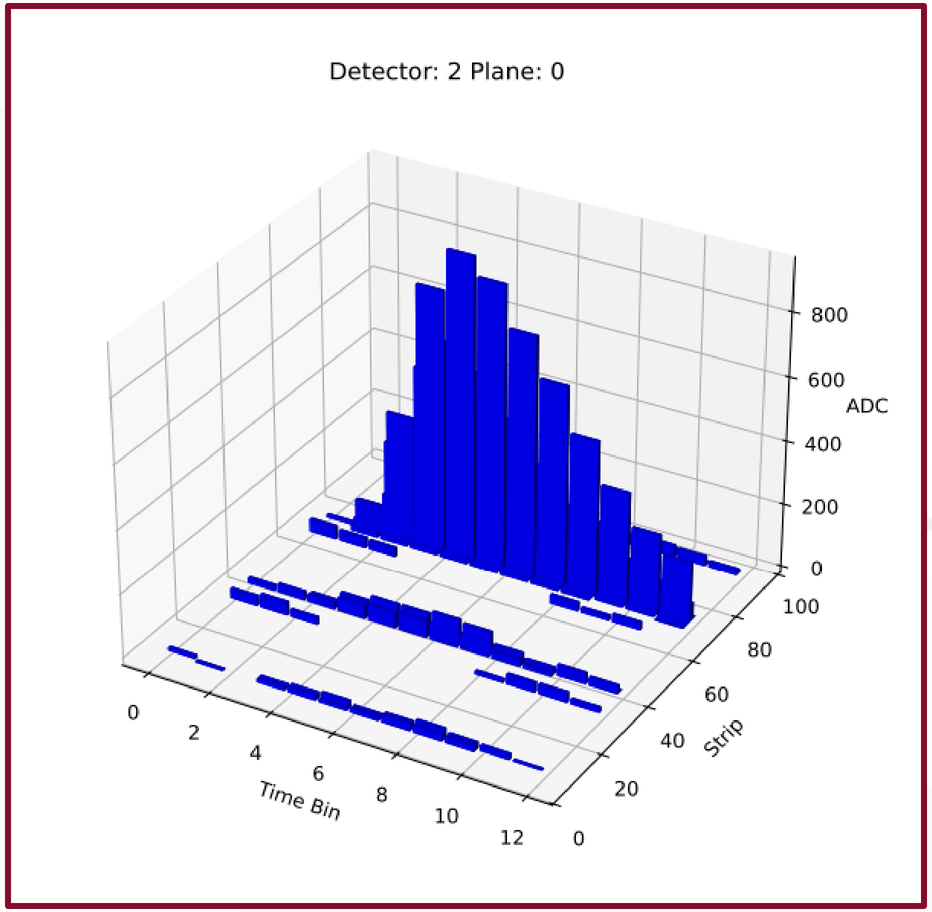
- Root file structure

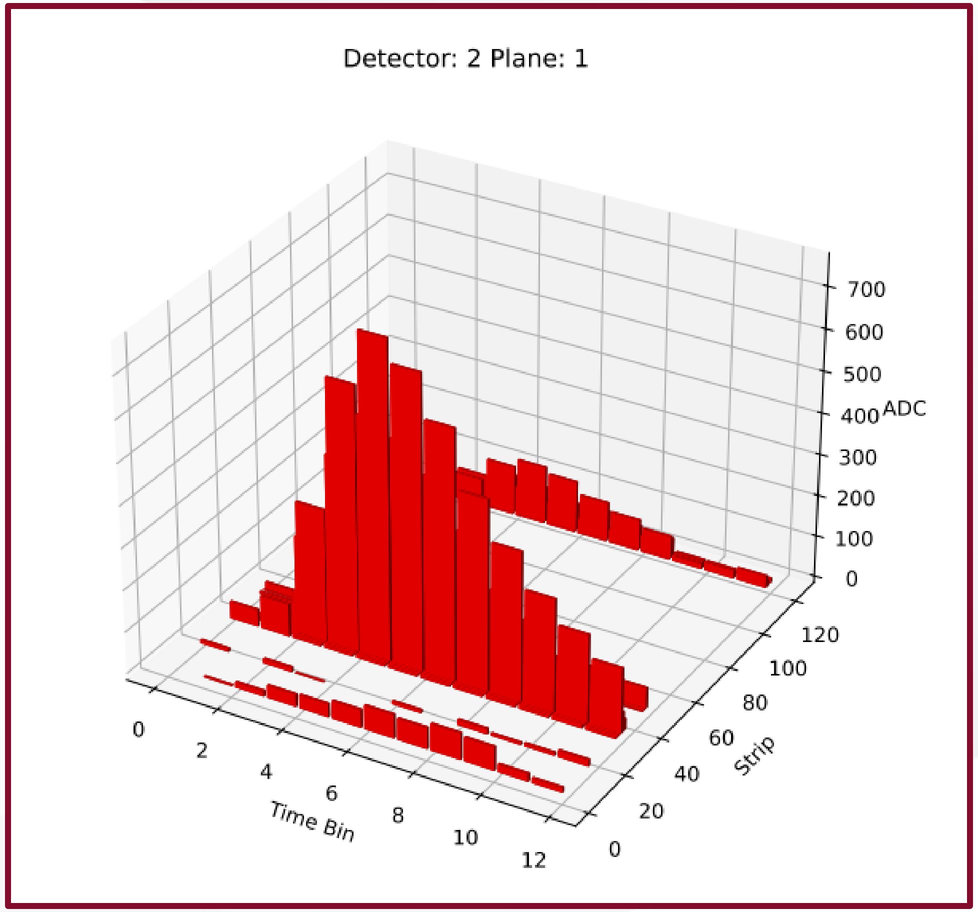
➢Root analysis interface

- AMORE-SRS



Task- Demo Plots for Tracker Data





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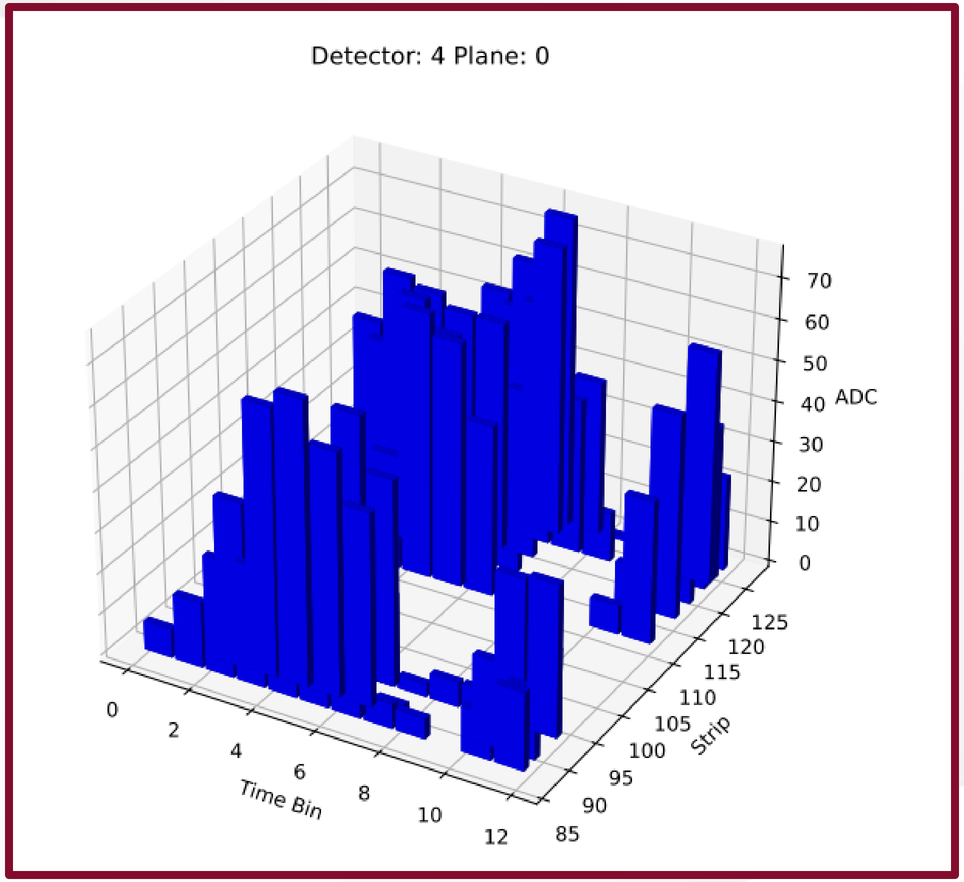
Milestone 2 Tasks

- Investigate how root interfaces with AMORE-SRS

➢ Correct channel mapping for cylindrical detector

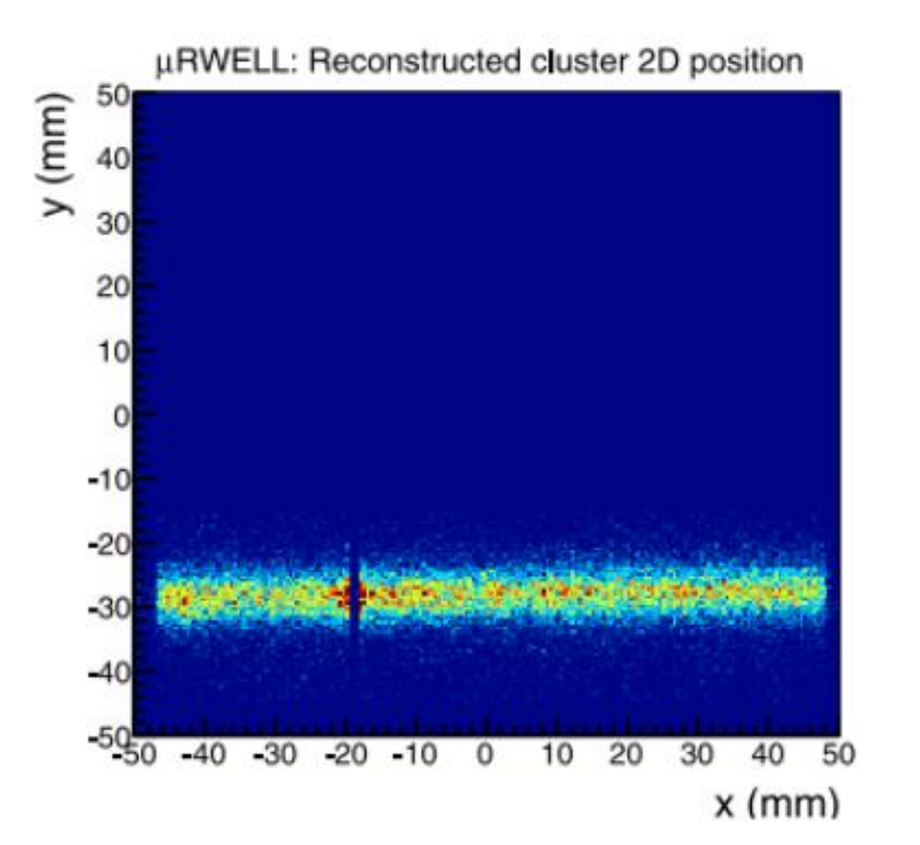
- Generate resolution plots



Milestone 2 Tasks

- Investigate how root interfaces with AMORE-SRS
- Correct channel mapping for cylindrical detector

➢Generate resolution plots



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Milestone 2 Task Matrix

Task	Alejandro	Summer
1. Beam reconstruction for the cylindrical data	50%	50%
2. Proving proper alignment of the trackers and cylindrical detector by matching strip/cluster data	50%	50%

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Thank you for listening

Questions?

Definitions

- **Detector-** A detector is a device used in particle physics to measure the position of charged particles.
- **µRWELL (Cylindrical micro-resistive well detector)-** µRWELL is a type of micro-pattern gaseous detector that combines gas electron multiplication with a resistive protection layer and a segmented readout structure to measure charged particles with high precision [1]. Designing a detector that is cylindrical is the novelty here.
- **Tracker-** In the context of this project, a tracker refers to an external planar detector. Four trackers are used to create a reference system for evaluating the efficiency of the cylindrical detector.
- **Readout board-** A readout board is an electronic circuit board that collects signals from detector channels. The readout board hosts APV chips and interfaces between the detector strips and the data acquisition system. Each readout board can only capture a single plane of the data. So in planar detectors, typically there is one for x and y positions, respectively.
- **Channels/strips-** Channels or strips are the readout elements on the detector surface that collect charge from ionization events. Each strip is connected to a specific APV channel. Strip signals are used to reconstruct particle hit positions.
- **APV chip (Analog Pipeline Voltage chip)-** An APV chip samples analog signals from each channel on the readout board in time bins.
- **Time bin-** A time bin is a discrete time sample recorded by the APV chip. Typically, 12-16 time bins are used to reconstruct the pulse shape of a beam.
- **ADC (Analog to Digital Converter value)-** ADC represents a numerical value for the current recorded on a particular strip.

Definitions cont.

- **AMORE-SRS (Analysis and Monitoring Of Readout Electronics and Scalable Readout System)-** AMORE-SRS is a live data acquisition framework for monitoring and organizing the data from the APV chips into a root file for analysis.
- **Root file-** The root file stores event data such as strip information, ADC values, and metadata. The data is organized into branches that correspond to specific variables.
- **3D Pulse plot-** A 3D pulse plot is a visualization of a single event where the x axis is time bin, the y axis is the strip number, and the z axis is the ADC value.
- **Resolution plot-** A resolution plot is a reconstruction of the 2d hit positions represented as a heat map.
- **Efficiency plot-** Efficiency plots compare the detectors efficiency against other performance characteristics such as amplification or drift field. Efficiency itself is defined as the ratio of the number of events with strip clusters seen in all five detectors divided by the number of events with strip clusters seen in just the four trackers [2].