Inaugural
US Muon Collider
Meeting

Fermilab, August 7-9, 2024 indico.fnal.gov/e/usmc2024

Contribution ID: **32** Type: **not specified**

Ultrafast Si detectors for timing/imaging layers in 5D calorimeters and particle identification at future high luminosity colliders

Achieving time stamping with resolution on the order of ten picoseconds will be vital to the success of future high luminosity collider experiments. Out-of-time effects such as pileup will drive down the efficiencies of current calorimeters, giving rise to the need for the addition of timing information to the energy measurements. Silicon-based sampling calorimeters may be ideal for this purpose. In some instances, a few timing/imaging layers may be sufficient to separate overlapping showers. A timing/imaging layer with picosecond accuracy also offers the opportunity of using time of flight measurements for hadron identification in a broader momentum range.

Low Gain Avalanche Diodes (LGADs) have been established as a viable option for four-dimensional tracking devices, as they can provide both position and timing information for incoming particle tracks. The introduction of LGADs to particle identification systems will improve time of flight measurements and calorimeter shower reconstruction, while suppressing the effects of pile-up and beam induced backgrounds. We outline the first steps in our efforts to study signal formation and timing resolution in LGADs of different areas, thicknesses, and gains, with the goal of optimizing cell sizes and fabrication parameters for shower detection and hadron identification while achieving the scalability and cost effectiveness needed for large scale applications.

Primary authors: MACK, Bridget (Syracuse University); ARTUSO, Marina (Syracuse University); RUDOLPH, Matthew (Syracuse University); MACKEY, Lauren (Syracuse University); DOWLING, Andrew (Syracuse University)

Presenter: MACK, Bridget (Syracuse University)

Session Classification: Poster Session and Reception