Inaugural
US Muon Collider
Meeting

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

Contribution ID: **46** Type: **not specified**

Hadronic Calorimeter and Jet Reconstruction Performance for a 10 TeV Muon Collider Detector Design adapted from CLIC

Moving towards a 10 TeV pCM collider will require novel detector technologies, designs, and software. Previous studies have analyzed the performance of a muon collider detector design adapted from CERN's Compact Linear Collider (CLIC) detector for collision energies up to 3 TeV. The work outlined in this poster looks to expand these studies to 10 TeV collider energies as well as adapt the detector design for these higher energies. In particular, this poster quantifies the HCAL performance through neutron reconstruction efficiency, resolution, and response. Monte Carlo neutron gun samples were generated with and without Beam-Induced-Background (BIB) in batches from 1 GeV to 5 TeV. With these samples, the impact of the BIB on various neutron reconstruction methods can also be compared. Furthermore, the variation in neutron reconstruction, resolution, and response are calibrated across both eta and incident neutron energy. An initial resolution goal of 35%/\sqrt{E} for the HCAL resolution was set to be sufficient for jet reconstruction, but these studies have demonstrated neutron energy resolutions around 15%/\sqrt{E} for samples below 100 GeV and below 6%/\sqrt{E} for 100 GeV to 5 TeV samples. The neutron reconstruction efficiency is also greater than 90% for incident neutrons with energies above 30 GeV. These neutron studies demonstrate that the new 10 TeV detector design has improved neutron efficiency and resolution compared to previous 3 TeV designs.

Primary author: SLEDGE, Elise

Presenter: SLEDGE, Elise

Session Classification: Poster Session and Reception