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-title-

Beam test results for a large-area GEM detector read out with radial zigzag strips

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-abstract-

The FLYSUB consortium conducted a beam test at the Fermilab Test Beam Facility in October 2013 to study performances of several Gas Electron Multiplier (GEM) prototype detectors that are being considered for forward tracking and particle identification in an experiment at a future Electron Ion Collider (EIC) in the US. Our group operated five GEM tracking detectors with different areas including one of the two largest GEM detector built and operated in the US to-date. This detector, a trapezoidal 1m-long Triple-GEM with 22-45 cm width, was designed with a readout using radial zigzag strips. This allows a substantial reduction of the total number of strips and electronics channel - and consequently system cost - while preserving good spatial resolution for tracking purposes. The design and manufacturing of the readout board with 1,024 zigzag strips is briefly described. We find that this detector performed well in the beam. The charged-particle detection efficiency is ~98%, strip cluster charge distributions closely follow a Landau shape, and measured spatial resolution is ~0.5 mm using charge sharing among adjacent zigzag strips with 2.5mm pitch. We discuss how the details of the interleaving of adjacent zigzag strips could be further improved in a re-designed readout board to get even better spatial resolution.

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-key words-

GEM, Beam test, EIC, Zigzag strip readout

-/key words-

-author-

Aiwu Zhang, Vallary Bhopatkar, Marcus Hohmann, Eric Hansen, Nicholas Lowing, Mike Phipps, Elizabeth Starling, Jessie Twigger, Kimberly Walton (Florida Institute of Technology)

-/author-