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Application of Large Scale Gas Electron Multiplier Technology to Digital Hadron Calorimetry

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The detectors proposed for future e+e- colliders (ILC and CLIC) demand a high level of precision in the measurement of jet energies. Various technologies have been proposed for the active layers of the digital hadron calorimetry to be used in conjunction with the Particle Flow Algorithm (PFA) approach. The High Energy Physics group of the University of Texas at Arlington has been developing Gas Electron Multiplier (GEM) detectors for use as the calorimeter active gap detector. To understand this application of GEMs, two kinds of prototype GEM detectors have been tested. One has 30cmx30 cm active area double GEM structure with a 3 mm drift gap, a 1 mm transfer gap and a 1 mm induction gap. The other one has two 2cmx2 cm GEM foils in the amplifier stage with a 5 mm drift gap, a 2 mm transfer gap and a 1 mm induction gap. We will summarize the results of tests of these prototypes, using cosmic rays and sources, in terms of their applicability to a digital hadron calorimeter system. We will discuss plans for the construction of 1mx1m planes of GEM digital hadron calorimetry to be used as part of a 1m³ stack to be used in a major test beam study of hadronic showers.

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