Contribution ID: **175**   Type: **Parallel**

Pattern Recognition for a Continuously Operating GEM-TPC

Thursday 24 May 2012 13:55 (25 minutes)

A pattern recognition software for a continuously operating high rate Time Projection Chamber with
Gas Electron Multiplier amplification (GEM-TPC) has been designed and tested.
A track-independent clustering algorithm delivers space points. A true 3-dimensional track follower combines
them to helical tracks, without constraints on the vertex position.
Fast helix fits, based on a conformal mapping on the Riemann sphere, are the basis for deciding whether points
belong to one track.

The software has been tested on simulated as well as on real data
taken in a physics run of the GEM-TPC prototype installed in the FOPI detector at GSI facility, Germany.
To assess the performance of the algorithm in a high-rate environment, ppbar-interactions
corresponding to a maximum average track density of 0.5 cm/cm^3 have been simulated.

The pattern recognition is capable of finding all kinds of track topologies with high efficiency
and provides excellent seed values for fitting or online event selection.
Computational costs are O(50) ms/track on a 3.1 GHz office PC.
Parallel implementation of the code on a graphics processing unit (GPU) is under investigation.

Structure, functioning and benchmark results of the algorithm will be presented.

Student? Enter 'yes'. See http://goo.gl/MVv53

yes

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Session Classification: Event Processing

Track Classification: Event Processing (track 2)