Contribution ID: **11** Type: **Poster presentation**

An Extensible Induced Position Encoding Readout Method for Micro-pattern Gas Detectors

Tuesday, June 7, 2016 3:00 PM (1h 30m)

The requirement of a large number of electronics channels has become an issue to the further applications of Micro-pattern Gas Detectors (MPGDs), and poses a big challenge for the integration, power consumption, cooling and cost. Induced position encoding readout technique provides an attractive way to significantly reduce the number of readout channels. In this paper, we present an extensible induced position encoding readout method for MPGDs. The method is demonstrated by the Eulerian path of graph theory. A standard encoding rule is provided, and a general formula of encoding & decoding for n channels is derived. Under the premise of such method, a one-dimensional induced position encoding readout prototyping board is designed on a 5×5 cm2 Thick Gas Electron Multiplier (THGEM), where 47 anode strips are read out by 15 encoded multiplexing channels. Verification tests are carried out on a 8 keV Cu X-ray source with 100μm slit. The test results show a robust feasibility of the method, and have a good spatial resolution and linearity in its position response. The method can dramatically reduce the number of readout channels, and has potential to build large area detectors and can be easily adapted to other detectors like MPGDs.

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Session Classification: Poster session 1

Track Classification: Emerging Technologies / Feedback on Experience