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A cluster finding algorithm for free-streaming input data

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In position-sensitive detectors with segmented readout (pixels or strips), charged particles activate in general several adjacent read-out channels. The first step in the reconstruction of the hit position is thus to identify clusters of active channels associated to one particle crossing the detector. In conventionally triggered systems, where the association of raw data to events is given by a hardware trigger, this is an easy-to-solve problem. It, however, becomes more involved in untriggered, free-streaming read-out systems like the one employed by the CBM experiment. Here, the time coordinate of the single-channel measurement must be taken into account to decider whether neighbouring active channels belong to a cluster. A simple extension of well-known cluster finding algorithms is not satisfactory because of involving increasing combinatorics, which are prohibitive for reconstruction in real-time. In this talk, we present a cluster-finding solution for the Silicon Tracking System of the CBM experiment which avoids any combinatorics or loops over detector channels. Its execution time is thus independent on the size of the data packages (time slices) delivered by the data acquisition, making it suitable for being used in online reconstruction.

Author: FRIESE, Volker (GSI - Helmholtzzentrum fur Schwerionenforschung GmbH (DE))

Presenter: FRIESE, Volker (GSI - Helmholtzzentrum fur Schwerionenforschung GmbH (DE))

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