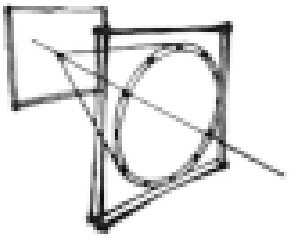

Contribution ID: **35** Type: **Oral presentation**

Real-time track-less Cherenkov ring fitting trigger system based on Graphics Processing Units

Tuesday 6 September 2016 17:25 (25 minutes)

In rare decays experiments an effective online selection is mandatory for the data acquisition system in order to reduce data bandwidth and save storage resources. The NA62 experiment at CERN studies ultra-rare kaon decays and makes use of a three-levels trigger system to reduce the 10 MHz incoming events rate of about three orders of magnitude before storage. The first trigger stage (L0) is a hardware synchronous system that achieves a rejection factor of 10 within the maximum latency of 1ms. Two other triggers run at software level on a computer farm and perform further filtering and final event building.
The NA62 Ring Imaging Cherenkov (RICH) detector consists of a 17m long vessel, 3m in diameter, filled with Ne at 1atm, read out by 2000 photo-multiplier tubes (PMTs), that has been designed to separate pions from muons in the 15-35 GeV/c momentum range. According to the baseline design of the experiment, primitives from the RICH detector at L0 consist only of PMT multiplicities in a pre-defined time window.
A dedicated system for generating advanced trigger primitives for the RICH at L0 has been implemented on commercial Graphic Processing Unit (GPU), and relies on the enhanced computation capabilities and high parallelization available on such devices. A fast ring-fitting algorithm is fed with raw RICH data, with no track information from the spectrometer, and information on the particle speed and direction is provided for a more selective L0 trigger decision.
This system has been installed in parasitic mode during the 2015 NA62 experimental run and relies on direct GPU communication using a FPGA-based network interface card called NaNet that allows strong latency reduction. For the forthcoming 2016 run the system is being upgraded with an improved version of NaNet equipped with 10 Gigabit Ethernet link. The system performance will be described and results of multi-ring Cherenkov reconstruction obtained during the NA62 physics runs will be presented.

Registered

Yes

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