Contribution ID: **471**   Type: **Poster**

Readout Studies for the HIKE Main Electromagnetic Calorimeter

Friday, 31 May 2024 09:05 (1 minute)

The High Intensity Kaon Experiment (HIKE) is a proposed experimental setup to be installed at the ECN3 beamline in CERN after the 2026-2029 shutdown period. It initially aims at further probing the $K^+ \to \pi^+ \nu \overline{\nu}$ to a precision of 5%, complemented by a diverse array of other rare K^+ decays. Following this phase, HIKE will focus on a neutral K_L beamline for the remainder of its data taking, the kaon data collection will be complemented by beam-dump measurements to search for feebly interacting particles. The experimental setup builds upon the proven NA62 layout, exploiting the same boosted kinematic approach and an efficient photon identification and veto system to reject backgrounds. To sustain a fourfold increase in kaon beam rate, the HIKE experiment requires a substantial improvement in all the detector timing, particularly in the veto system, to minimize the random veto effects. In particular, the new fine-sampling shashlyk Main Electromagnetic Calorimeter (MEC) has a design time resolution goal of ≈ 100 ps while maintaining an energy resolution comparable with NA62 Liquid Krypton calorimeter.

In this contribution to the conference, we present research and development activities in investigating readout options for the MEC. We present firmware prototypes implemented in Xilinx Ultrascale+ FPGAs processing data from commercial off-the-shelf analog-to-digital converters running at 1 Gsps sample rate with a 14-bit dynamic range. One of the goals of this work is to investigate real-time data reduction techniques, including feature extraction and zero suppression, in view of HIKE's streaming data acquisition system. Moreover, we study solutions for fixed-phase clock distribution and synchronization among multiple boards to guarantee a coherent detector readout. We will finally describe the flexibility of our solution, which also features standard Gigabit Ethernet data output for usage in prototypal test beams.

Collaboration

HIKE Collaboration

Role of Submitter

I am the presenter

Primary authors: DI DONATO, Camilla (Istituto Nazionale di Fisica Nucleare); AMBROSINO, Fabio (Istituto Nazionale di Fisica Nucleare); SARACINO, Giulio (Istituto Nazionale di Fisica Nucleare); DE NARDO, Guglielmo (Istituto Nazionale di Fisica Nucleare); ROSA, Ilaria (Istituto Nazionale di Fisica Nucleare); FRANCESCONI, Marco (INFN - Napoli); MIRRA, Marco (Istituto Nazionale di Fisica Nucleare); NAPOLITANO, Marco (NA); MEROLA, Mario (Istituto Nazionale di Fisica Nucleare); MASSAROTTI, Paolo (Istituto Nazionale di Fisica Nucleare); GIORDANO, Raffaele (Istituto Nazionale di Fisica Nucleare); FIORENZA, Renato (Scuola Superiore Meridionale)

Presenter: FRANCESCONI, Marco (INFN - Napoli)

Session Classification: Electronics and On-Detector Processing - Poster session

Track Classification: T7 - Electronics and On-Detector Processing