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The Level-0 Trigger of the NA62 Liquid Krypton Calorimeter and its performance during first data-taking activities in 2015.

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The Liquid Krypton calorimeter of the NA62 experiment at the CERN SPS is an essential part of the photon-veto system. The Level-0 trigger of the calorimeter identifies electromagnetic clusters and provides their position, fine-time and energy information for the trigger decision.
In this contribution we present the first results and performances of the full system during the physics data-taking
run in 2015.

Summary

The Level-0 LKr electromagnetic calorimeter trigger (LKrL0), identifies electromagnetic clusters in the calorimeter and prepares a time-ordered list of reconstructed clusters together with the arrival time, position, and energy measurements of each cluster. The trigger is a three-layer parallel system, composed of 28 front-end and 8 concentrator boards based on the 9U TEL62 boards and equipped with custom dedicated mezzanines called TELDES, LKrL0 TX and LKrL0 RX. The trigger algorithm is based on energy deposits in 864 digital sums (TSL) of 16 calorimeter cells each, which are digitized and transmitted by the Calorimeter REAdout Modules (CREAMs). The electromagnetic cluster search is executed in two steps with a two-dimensional algorithms (1D + 1D algorithm). In the first step, each front-end board receives data from a vertical slice of the calorimeter (that contains up to 32 TSL) and looks for peaks in the energy deposit in the vertical slice. In the second step, the concentrator boards receive trigger data from up to eight front-end boards and combine the peaks detected by different front-end boards into a single cluster.

The TELDES mezzanine receives and deserializes digitized data (16 bit @ 40 MHz over 15 m long ethernet cables) from the CREAMs. The LKrL0 TX and LKrL0 RX mezzanines transmit reconstructed clusters (48 bit @ 80 MHz over 2 m long individually shielded twisted pair cables) from the front-end to the concentrator cards and between the two layers of concentrator cards. Two 48 bit words (including the payload and error correction code) are needed to transmit energy, position and time of a single cluster allowing the transmission of up to 40 MHz of clusters reconstructed by each front-end board from a single 32 tiles calorimeter slice.

The system was partially installed (15%) and tested during a

commissioning run in 2014. The first physics run of NA62 is scheduled to start at the beginning of July 2015 and the full trigger system will be used for the first time. In this contribution we will present performances and results obtained in the first months of data taking.

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