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The data acquisition system of the KM3NeT detector

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The KM3NeT neutrino telescope is part of a deep-sea research infrastructure being constructed in the Mediterranean Sea. The basic element of the detector is the Detection Unit, a 700 meter long vertical structure hosting 18 Digital Optical Modules (DOMs). The DOM comprises 31 3" photomultiplier tubes (PMTs), various instruments to monitor environmental parameters, and the electronic boards for the digitization of the PMT signals and the management of data acquisition.

Dedicated readout electronics have been developed and are installed inside each DOM, allowing to measure the time of arrival and the duration of photon hits, on each of the 31 photomultiplier tubes, with a time resolution of 1 ns. Moreover, the data transmission system of the DOMs supports a data transfer rate up to 250 Mbps, which corresponds to a photon-hit rate of 15 kHz on each PMT.

Due to the extreme operation conditions of the abyssal site, the all-data-to-shore concept is used in order to minimize the complexity of the offshore detector. The processing of the data transmitted to onshore is performed by the Trigger and Data Acquisition System (TriDAS). The networking infrastructure and computing resources are conceived to be modular and scalable in order to manage the full data rate from the final cubic-kilometer scale telescope.

The electronics and the DAQ system described in the poster are currently under test in the first Detection Unit deployed offshore Toulon and operated since spring 2015.

Collaboration

KM3NeT

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