Contribution ID: **473** Type: **Poster**

A novel real-time control system for next generation gravitational waves detectors

Friday, 31 May 2024 09:06 (1 minute)

This contribution would like to present the architecture of a new Real-time Control System (RCS), intended to serve as the foundation for next generation large scale interferometers for the detection of gravitational waves. In particular, the initial phase of Einstein Telescope (ET) detector is the target for this development.

The RCS coordinates complex closed-loop systems, managing data collection from sensing elements, processing and actuator control within well defined time constraints. It is a very complex object tasked with managing multiple control units, distributed in space, facilitating their intercommunication, and handling communications with users and other systems.

Two distinct hardware approaches, "Katane" and "Zancle," are explored. The primary difference is the main processing element on which each system is based. "Katane"system, is built on powerful DSP processor boards, drawing inspiration from the Super-Attenuator control system, developed in Pisa for Advanced Virgo detector, while "Zancle"investigates the feasibility of GPU-based processing.

"Katane"is based on a MicroTCA.4 standard architecture ensuring flexibility, easy maintenance, and fast data exchange among its various custom modules. These modules include high-precision, low-noise Front-End data converter boards, FPGA-based pre-processing boards, and standard CPUs. The "Katane"project has progressed to an advanced stage, featuring the design of main boards. Substantial development and testing efforts have been invested in creating firmware and software dedicated to system control and monitoring.

On the other hand, "Zancle" is not presently based on MicroTCA standard. However, this project aims to employ cost-effective systems designed for the consumer market. Currently, our focus is on testing the feasibility of utilizing direct memory access (DMA) techniques to diminish the latency of data exchange between GPU and data converters. This effort aims to capitalize on the significant computational power offered by these elements and leverage the use of machine learning algorithms.

Collaboration

ET, ETIC

Role of Submitter

I am the presenter

Primary authors: GENNAI, Alberto (Istituto Nazionale di Fisica Nucleare); PASSUELLO, Diego (Istituto Nazionale di Fisica Nucleare); PILO, Federico (Istituto Nazionale di Fisica Nucleare (INFN)); SPADA, Francesca Romana (Istituto Nazionale di Fisica Nucleare); FRASCONI, Franco (Istituto Nazionale di Fisica Nucleare (INFN)); PIENDIBENE, Marco (PI); BITOSSI, Massimiliano; PROSPERI, Paolo (INFN - Pisa); Dr BOSCHI, Valerio (Istituto Nazionale di Fisica Nucleare)

Presenter: PROSPERI, Paolo (INFN - Pisa)

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

Track Classification: T7 - Electronics and On-Detector Processing