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Lecture: Front-end electronics and optical links

Wednesday 10 February 2021 13:00 (45 minutes)

Data acquisition electronics for particle detectors is generally structured into front-end and back-end systems. The front-end electronics must be placed close to the sensors in order to minimize the noise. Thus, they are usually located inside the detector which typically implies a high radiation environment. It includes an analog part with a signal conditioning stage which depends on the sensor type and the magnitude of interest. Then, the signals are digitized and after an event selection transmitted through optical links to the back-end system located in the counting rooms.
The front-end electronics is usually implemented with radiation tolerant custom ASICs but depending on the radiation levels the utilization of Commercial Of-The-Shelf components is also possible.
Over the past two decades the speed of optical fiber communications has increased one order of magnitude having a great impact in the architecture of new data acquisition systems. Part of the former front-end functionalities can be moved now to the off-detector system in a radiation free environment.
In this presentation we will cover the main aspects of the data acquisition electronics systems for particle detectors and their evolution over the past 20 years.

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