

A modern and versatile data-acquisition package for calorimeter prototypes test-beams: H4DAQ

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The upgrade of the calorimeters for the HL-LHC or for future colliders requires an extensive programme of tests to qualify different detector prototypes with dedicated test beams. A common data-acquisition system (called H4DAQ) was developed for the H4 test beam line at the North Area of the CERN SPS in 2014 and it has since been adopted by an increasing number of teams involved in the CMS experiment and AIDA groups. Several different calorimeter prototypes and precision timing detectors have used H4DAQ from 2014 to 2017, and it has proved to be a versatile application, portable to many other beam test environments (the CERN beam lines: EA-T9 at the PS, H2 and H4 at the SPS, and at the INFN Frascati Beam Test Facility). The H4DAQ is fast, simple, modular and can be configured to support different setups. The different functionalities of the DAQ core software are split into three configurable finite state machines: the data readout, run control, and event builder. The distribution of information and data between the various computers is performed using ZEROMQ (0MQ) sockets. Different plugins are available to read different types of hardware, including VME crates with different types of boards, PADE boards, custom front-end boards and beam instrumentation devices. The raw data are saved as root files, using the CERN c++ root libraries. A Graphical User Interface, based on the python gtk libraries, is used to operate the H4DAQ and integrated data quality monitoring (DQM), written in c++, allows for fast processing of the events for quick feedback to the user. The 0MQ libraries are available as well for the National Instruments LabVIEW program. This facilitates communication with existing instrumentation and detector control systems, via commands issued by the H4DAQ GUI. The design, functionality and operational experience with the H4DAQ system will be described in this talk.

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