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Back-end Electronics based on an Asymmetric Network for Low Background and Medium Scale Physics Experiments

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The readout architecture introduced in this paper is intended for small to medium size physics experiments that have moderate bandwidth needs, and applications that require ultimately low background radioactivity front-end components. I detail a protocol based on time division multiplexing to transport from a back-end unit over a low speed fanout network –which could simply consist of a multi-drop cable –all the information required to synchronize, configure, monitor and control the read out of multiple front-end devices. A set of medium speed unidirectional point-to-point links connect front-end units to a common back-end, and transport simultaneously synchronous traffic, acquired data and slow control. Using links of the minimum required speed gives large freedom to select optimal materials among copper media, glass optical fibers coupled to transceivers based on laser diodes, or visible LEDs transmitters attached to plastic optical fibers. On the front-end link receiver side, I demonstrate the use of a clock and data recovery circuit which overcomes the lower speed bound of serial transceivers embedded in FPGAs. I show the design of a back-end unit capable of controlling 32 front-end units at up to 10 Gbps of aggregate bandwidth using an inexpensive commercial FPGA module where the comparatively large number of regular I/O pins interface to the front-end links, while the few available multi-gigabit per second capable transceivers are affected to the communication with the upper stage of the DAQ system. I describe several deployment scenarios and explain how some other applications could benefit from the described concepts.

Minioral

Yes

Description

network

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