

A Scalable FPGA-Based Digitizing Platform for Radiation Data Acquisition

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Regulating the proliferation of nuclear materials has become an important issue in our society. In order to detect the radiation given off by nuclear materials, systems implementing detectors connected to data processing modules have been developed. We have implemented a scalable, portable detection platform with a data processing module about the size of an external DVD hard drive. The data processing component of our system utilizes real-time data handling, the potential for growth, and behavior modifications through custom FPGA code editing. The size of our system is dynamic, so additional input channels can be implemented if necessary. This paper presents a scalable, portable detection system capable of transmitting streaming data from its inputs to a PC or laptop. The data arrives at the inputs of the data capturing module, is processed in real time by the onboard FPGA and then is transferred to a PC or laptop via a PCIe cord in discrete packets. The maximum transfer rate from the FPGA to the PC is 2000 MB/s. The Detection for Nuclear Non-Proliferation Group at the University of Michigan will use the detection platform to achieve pre-processing of radiation data in real time. Such pre-processing includes pulse shape discrimination, pulse height distributions, and particle times of arrival.