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Present and Future Applications of Digital Electronics in Nuclear Science - a Commercial Prospective

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Digital readout electronics instrumenting radiation detectors have experienced significant advancements in the last decade or so. This on one hand can be attributed to the steady improvements in commercial digital processing components such as analog-to-digital converters (ADCs), digital-to-analog converters (DACs), field-programmable-gate-arrays (FPGAs), and digital-signal-processors (DSPs), and on the other hand can also be attributed to the increasing needs for improved time, position, and energy resolution in nuclear physics experiments, which have spurred the rapid development of commercial off-the-shelf high speed, high resolution digitizers or spectrometers. Absent from conventional analog electronics, the capability to record fast decaying pulses from radiation detectors in digital readout electronics has profoundly benefited nuclear physics researchers since they now can perform detailed pulse processing for applications such as gamma-ray tracking and decay-event selection and reconstruction. In this talk, present state-of-the-art digital readout electronics and its applications in a variety of nuclear science fields will be discussed, and future directions in hardware development for digital electronics will also be outlined, all from the prospective of a commercial manufacturer of digital electronics.