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Title: Ultra-Fast Hybrid-CMOS Imaging System for Multi-Frame Proton Radiography

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Ultra-Fast Hybrid-CMOS Imaging System for Multi-Frame Proton Radiography

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The performance of 4-Mframe/s burst-mode imager with 3-frame in-pixel storage will be evaluated. The 720×726px ultra-fast hybrid FPA and camera was fabricated by Rockwell Scientific (now Teledyne). Multiple cameras have been in operation for several years, in a variety of static and dynamic experiments at the 800MeV proton radiography (pRAD) facility at the LANL LANSCE accelerator. The cameras can operate with per-pulse adjustable inter-frame time of 250ns to 2s with an exposure/integration-time as short as 180ns. With a 70 ms readout time, it can be externally synchronized to 0.1-to-5Hz, 50-ns wide proton beam pulses, and record 1000-frame radiographic movies of 5-to-30 minute duration (still with 180ns or longer shutter time). The effectiveness and dependence of the global electronic shutter on the pixilated Si-sensor bias voltage will be discussed, and compared to a "commercial" fast CMOS camera. The spatial resolution dependence of the imaging system on various monolithic and "structured" scintillators and phosphor screens will be described.
We will also present features of a new-generation 10-frame 1024×1024 pixel, 50-ns shutter, 12-bit dynamic range imager, which is now in a final design stage.

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