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PSD_CHIP_V2: An Improved Highly Programmable SiPM Readout ASIC For Neutron Imaging

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PSD_CHIP_V2 is a prototype ASIC that incorporates several features for fast neutron and gamma detection including pulse shape discrimination (PSD) capability, fast time resolution, on-chip integration of total energy, flexibility using programmable registers, low power usage, and scalability. Designed specifically for readout of SensL SiPMs, which have two coupled outputs - a capacitively coupled fast output (FOUT) and a resistively coupled standard output (SOUT) - PSD_CHIP_V2 performs a novel, real-time, analog PSD method. While intended to be used for a double-scatter neutron imager, this chip can be integrated into the front-end of multi-channel, SiPM-readout, neutron-imaging systems with generic topologies. Furthermore, this ASIC features a high level of on-chip programmability to facilitate its use with various scintillators in a final, integrated, neutron imager setup. Design overview, combined with preliminary testing results of PSD_CHIP_V2, will be presented. Bench tests of the PSD scheme using digitized data from a SiPM will also be presented.

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