



Contribution ID: 62

Type: **Presentation**

An ASIC for Real Time Analog Pulse Shape Discrimination

Friday, September 23, 2022 2:50 PM (15 minutes)

Pulse shape discrimination (PSD) is a powerful tool for separating gamma induced interactions from those induced by fast neutrons. It relies on the fact that various excited modes have different decay constants, and are excited differently by neutrons and gammas. This is especially true for liquid argon targets. We have designed and developed a custom integrated circuit that reads out scintillation pulses and performs PSD in real time. The ASIC also provides a fast output for time of arrival and an analog level representing the total pulse area. The method has been tested using various scintillators coupled to silicon photomultipliers, however, the ASIC can be deployed in a wide variety of instruments. Some key revisions will allow this ASIC to be functional at liquid argon temperatures.

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Session Classification: Signal reconstruction

Track Classification: Light/charge readout (PMT, SiPM, WLS, electronics etc.)