



Contribution ID: 382

Type: **Poster**

A 16-Channel Fast-timing ASIC for TRIDENT Large-area SiPM Arrays Readout

TROpIcal DEep-sea Neutrino Telescope (TRIDENT) features the hybrid digital optical module (hDOM) as the detector unit, containing large-area silicon photomultiplier (SiPM) arrays combined with photomultiplier tubes to boost photon detection efficiency and timing capability, which is crucial to angular resolution performance of TRIDENT. We are developing a 16-channel fast-timing application-specific integrated circuit (ASIC) for high-precision time measurements to cope with the large input capacitor. In the first version of the prototype ASIC, we designed and compared four different architectures. We ultimately chose the most appropriate front-end circuit, which consisted of a negative feedback common gate stage and a current discriminator. The outputs of 16 discriminators are merged into one channel by fast OR gates and then transmitted to the off-chip time-to-digital converter. The latency inconsistency between channels is reduced by programmable delay chains. The post-simulation shows that the timing jitter of 16 channels combined with $64\ 3 \times 3\ \text{mm}^2$ SiPMs is around 500 ps with a single photo-electron signal input. The total power consumption is about 60 mW, which is three times lower than that of the non-ASIC solution.

Collaboration(s)

TRIDENT

Authors: WANG, Mingxin (Shanghai Jiao Tong University); Prof. WU, Weihao (Shanghai Jiao Tong University)

Presenter: WANG, Mingxin (Shanghai Jiao Tong University)

Session Classification: PO-2

Track Classification: Neutrino Astronomy & Physics