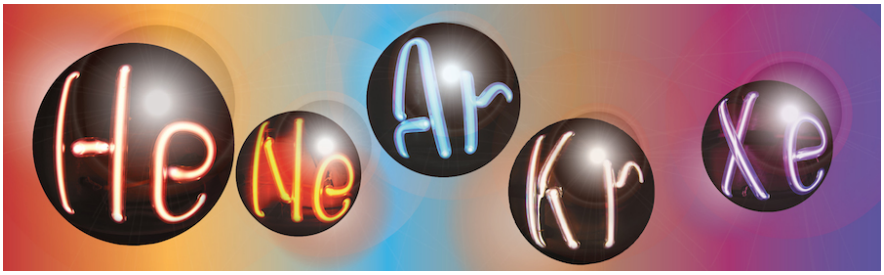

Contribution ID: **63** Type: **not specified**

CMOS based SPAD Arrays for light detection in rare event search experiments

Friday, 17 September 2021 09:00 (15 minutes)

Experiments searching for rare physics events using scintillation in liquid noble gases are steadily increasing in size. They require detector systems capable of measuring individual optical photons with excellent efficiency while covering large areas. In addition, the radioactive background introduced by such systems must be extremely low. We propose SPAD arrays based on CMOS technology as a possible solution for such an application case. This technology allows for manufacturing SPADs and the associated CMOS readout logic side by side, creating a fully functional photon detector system one a single silicon die. No further discrete components in direct vicinity and only few digital signals are required to operate a chip so that large areas can be covered in a straight forward way with very low material budget. We have developed a chip architecture which offers a very low power dissipation and a high fill factor. We have operated a prototype chip with different SPAD geometries at low temperatures of 100/160K and measured dark count rates of 0.01/0.1 Hz per mm^2 of active SPAD area, respectively. Our data driven readout architecture has an idle power consumption of only 1.75 mW and a signal dependent contribution of about 15 μW per 1000 hits per second. Based on these results we propose a full detector concept to cover large areas with high fill factor requiring only 7 electrical signals for operation.

Primary author: KELLER, Michael (Heidelberg University)

Co-author: Prof. FISCHER, Peter (Heidelberg University)

Presenter: KELLER, Michael (Heidelberg University)

Session Classification: Light/Charge Readout (4A)

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