Contribution ID: **22** Type: **Oral/Presentation**

Remote: Digital SiPM Chip with High Fill Factor and Fully Integrated Serial Readout for Rare Photon Detection

Wednesday 20 November 2024 09:54 (27 minutes)

Digital SiPMs combine Single Photon sensitive Avalanche Diodes (SPADs) and CMOS transistors on a single piece of silicon. The direct access to the large signal of an individual firing SPAD eliminates the need for analogue amplification and allows for disabling individual noisy cells, so that the overall dark count rate is greatly reduced. A readout scheme tailored to a particular application can be integrated so that no further electronics is needed and systems become mechanically simple, compact and low power. A design challenge is to keep the readout as basic as possible so that the area required for circuitry does not degrade too much the fill factor, i.e\. the fraction of photo-sensitive area. We have developed a chip for the readout of randomly occurring photon signals with moderate rates targeted primarily for liquid scintillator experiments in fundamental physics, like DARWIN or XLZD. The chip with a size of $\approx 8 \times 9\,\mathrm{mm}^2$ has a fill factor of above 72%, taking into account all readout circuitry, wire-bonding pads and chip edges. It is subdivided into 32×30 pixels of $250 \times 291\,\mu\mathrm{m}^2$ size. Each pixel contains 9 SPADs which can be individually disabled, their hit signals are ORed together. The fully digital readout provides the x/y coordinates of hit pixels and a time stamp with $\approx 10\,\mathrm{ns}$ resolution. Only power, SPAD bias and 4 CMOS signals are needed to operate a chip. A custom serial configuration and readout scheme allows for daisy-chaining a large number of chips. By the time of the conference, the chip should be back from production and we hope to present first measurements.

Do you need a VISA letter for traveling to Canada ?

No

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Session Classification: Digital Photosensors (1) (Chair: Massimiliano Fiorini, Luigi Pio Rignanese)

Track Classification: Invited Talk