

Blumino: a fully integrated analog SiPM with on-chip time conversion

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Blumino is a fully integrated analog silicon photomultiplier with on-chip discriminator and time-to-digital converter. The benefit of this approach is the scalability and compactness. In addition, the small form factor, high gain and low parasitic capacitance improve the overall timing performance. The sensor comprises an analog SiPM developed by On Semiconductor which exhibits a PDE greater than 40 % at 420 nm and DCR of 81.7 kcps/mm². The total sensitive area is 3 mm x 3 mm with a fill factor of 75 %. The integration process combined custom SPAD processes with standard CMOS in a 350 nm technology node. A compact board was developed to take advantage of the sensor characteristics (separate timing and energy channels) and to allow tiling for a more complex coincidence system. The sensor board comprises a transimpedance amplifier, a fast comparator, a charge integrator and adjustable supply and bias voltages, all controlled by a microcontroller that also offers pre-processing capabilities. The current system offers great potential for different coincidence configurations of various dimensions.

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