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SiPMs with Bulk Integrated Quench Resistors - Future Perspectives

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Recent years a tremendous development in the field of Silicon photomultipliers (SiPMs) has been persuaded. Several companies offer commercialized products that can be already used as a modern replacement of conventional photmultiplier tubes. We have proposed and demonstrated functionality of a new concept for SiPMs in which the quench resistor is integrated into a bulk bellow the sensitive region (SiMPl concept). SiMPL devices with an unobstructed entrance window are attractive for many applications. Since the first results of the prototype production were very encouraging we continued to explore possible further developments for our devices. Our technology offers the possibility for the construction of pixel tracking detectors with excellent time resolution and low power dissipation using 3D integration technologies to add a signal processing layer to the SiPM matrix. Such devices are of high interest for future lepton colliders, and will also be applicable in other environments. Additionally if signal processing layer is integrated from the back side of the sensor, light sensitive device with digital output and very high fill factor can be made. This paper will discuss these two concepts.

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