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# Experimental study of the time resolution of SiPM coupled to scintillator

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Since few years, SiPMs are replacing the standard PhotoMultiplier technology thanks to the many advantages (high efficiency, single photon sensitivity, high gain with low voltage, compact and robust, low power consumption  $\sim 50 \mu\text{W}/\text{mm}^2$ ) and lower costs, with the corresponding possibility to achieve also higher segmentations in calorimetry or other applications. Also in view of experiments at future colliders like HL-LHC or FCC or medical applications like TOF-PET, an important R&D on timing performances of SiPMs-scintillator detectors has started, with the goal of including them in the list of possible 4-D tracking-timing devices. An R&D on SiPM coupled to scintillator time resolution has been performed. Here the results obtained using both a cosmic ray setup and a beam test setup are reported. Different geometries of SiPMs coupled to the scintillator and different size of scintillator have been also studied, together with the possibility to use optical fibers to move the sensor away from the hypothetical high-radiation area. A time resolution of  $\sim 60$  ps, comprehensive of the full electronic chain, from the front-end to the readout electronics, has been reached with SiPMs coupled to a  $2 \times 2 \times 3 \text{ cm}^3$  plastic scintillator.

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