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Time resolution and efficiency of SPADs and SiPMs for photons and charged particles

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Single-photon avalanche diodes (SPADs) and silicon photomultipliers (SiPMs) are important tools for the detection and counting of single photons with excellent timing capabilities. I will give an overview of the physical mechanisms that determine the time resolution and the efficiency of these detectors. I will show calculations indicating that single-photon time resolutions of better than 10 ps should be achievable at high electric fields. The same arguments suggest that SPADs and SiPMs can also be used as detectors for charged particles with high efficiency and comparable time resolution.

Based on <https://arxiv.org/abs/2102.00091> and <https://arxiv.org/abs/2012.11285>

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