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Array of Saturated Gain Avalanche Diodes (ASGAD) concept for tracking

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The Single Photon Avalanche Diode (SPAD) technology relies on saturated gain, i.e. the complete discharge of the diode, for detecting single charge carriers, electrons or holes, usually produced by single photons. SPADs will detect the carriers produced by charged particles, however the signal may be buried in thermal noise, without the ability to identify one (thermal) carrier from multiple ionization carriers. We introduce the ASGAD concept that overcome this issue, and enable high purity detection of charge particles enabling to achieve the outstanding timing resolution of SPADs, that is expected to be 10ps or better for digital SPADs. In general we will discuss the pros and cons of using saturated gain avalanche diodes associated with integrated digital electronics for tracking. We will also look at how this technology can be used beyond single photon detection for dark matter search and keV scale electron detection.

Submission declaration

Original and unpublished

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