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High radiation resistance LGAD designs

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In the past few years, the Low Gain Avalanche Detector (LGAD, thin silicon detectors with modest internal gain and extremely good time resolution) technology have been significantly advanced. The first application of this kind of device will be in the ATLAS and CMS timing layers at the HL-LHC. The first prototypes of LGADs produced few years ago within the collaborations did not show sufficient radiation hardness. However, LGADs with radiation hardness up to a fluence of 2.5E15 Neq/cm2 were developed in the last 5 years thanks to a focused R&D effort.
This successful development paves the path for next generation machines (e.g., FCC-hh) that will require radiation tolerance an order (or more) of magnitude greater and at the same time require a better timing and position resolution. The cited requirements are in a high pile-up environment that is not suitable for AC-LGADs which is the most advanced high granularity LGAD prototype.
There are several new LGAD prototypes that are geared towards satisfying all of these requirements as well as radiation hardness, this contribution will give a brief overview on them and the path forward in their development.

Authors: SEIDEN, Abraham (University of California,Santa Cruz (US)); Prof. SCHUMM, Bruce Andrew (University of California,Santa Cruz (US)); SADROZINSKI, Hartmut (University of California,Santa Cruz (US)); SADROZINSKI, Hartmut (SCIPP, UC santa Cruz); Dr OTT, Jennifer (University of California,Santa Cruz (US)); GIGNAC, Matthew (University of California,Santa Cruz (US)); Dr MAZZA, Simone Michele (University of California,Santa Cruz (US)); ZHAO, Yuzhan (University of California Santa Cruz)

Presenter: Dr MAZZA, Simone Michele (University of California,Santa Cruz (US))

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