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Investigation of low gain avalanche detectors exposed to proton fluences beyond $10^{15} \text{ n}_{eq} \text{ cm}^{-2}$

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Low gain avalanche detectors (LGADs) promise excellent timing resolution, which can mitigate mis-assignment of vertices associated with pileup at the High Luminosity LHC and other future hadron colliders. The most highly irradiated LGADs will be subject to $2.5 \times 10^{15} \text{ n}_{eq} \text{ cm}^{-2}$ of hadronic fluence during HL-LHC operation; their timing performance must tolerate this. Hamamatsu Photonics K.K. and Fondazione Bruno Kessler LGADs have been irradiated with 400 and 500 MeV protons respectively in several steps up to $1.5 \times 10^{15} \text{ n}_{eq} \text{ cm}^{-2}$. Measurements of the acceptor removal constants of the gain layers, evolution of the timing resolution and charge collection with damage, and inter-channel isolation characteristics, for a variety of design options, are presented here.

Early Career

No

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