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Radiation damage effects overview on Low Gain Avalanche Diodes

Monday, 13 March 2023 10:00 (30 minutes)

Radiation damage mechanisms in depleted sensors with intrinsic gain (LGADs) are probed via electrical characterization, timing measurements and acceptor removal estimation. An analytical model is developed to prove gain vs field coefficients in proton and neutron irradiated sensors up to $6 \times 10^{15} \text{ n}_{eq}/\text{cm}^2$ with an emphasis on the gain layer geometry. The breakdown, efficiency and stability issues are investigated in deeply carbonated substrates as well as for boron and Gallium implanted gain layers. The series is completed by detailed SiMS measurements, process simulations and single event burn-out studies on CNM and FBK produced LGADs. An emphasis is placed on future developments with defect engineering and gain layer compensation studies using indium and Lithium co-implantation with preliminary results on both techniques.

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