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Particles tracking at fluences above 1E16 n/cm2

In this talk, the possibility of using very thin Low Gain Avalanche Diodes (LGAD) (~ 25µm thick) as tracking detector at future hadron colliders, where particle fluence will be above 1·1016neq/cm2 , will be explored. In the present design, silicon sensors at the High-Luminosity LHC will be 100- 200µm thick, generating, before irradiation, signals of 1-2 fC. In our talk, we will show how very thin LGAD can provide signals of the same magnitude via the interplay of gain in the gain layer and gain in the bulk up to fluences above 1·1016neq/cm2: up to fluences of 0.1-0.3·1016neq/cm2, thin LGADs maintain a gain of ~ 10 while at higher fluences the increased bias voltage will trigger the onset of multiplication in the bulk, providing the same gain as previously obtained in the gain layer. Key to this idea is the possibility of a reliable, high-density LGAD design able to hold large bias voltages (~ 500V). The talk will first present in detail this idea, then show our predictions based on our simulation package Weightfield2 and show how they compare to experimental data.

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