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First results from thin silicon sensors irradiated to extreme fluence

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In this contribution, we present a new development of radiation-resistant silicon sensors produced by the Fondazione Bruno Kessler (FBK, Italy). The design of the sensors exploits the recently observed saturation of radiation damage effects on silicon, together with the usage of thin substrates, intrinsically less affected by radiation. To cope with the small signal coming from thin sensors, the internal multiplication of the charge carriers will be used. At FBK, Low-Gain Avalanche Diodes (LGADs) have been produced on 25 and 35 μm thick p-type epitaxial substrates: when new, the signal multiplication will occur due to the gain layer typical of the LGAD design; after irradiation, the loss of gain resulting by the deactivation of the gain layer atoms will be compensated by the increase of the operating bias. The goal is to prove that the new sensors can efficiently operate up to fluences of 1E17 1MeV neutron equivalent/cm^2.

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