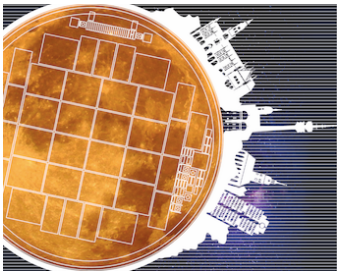

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Study of the radiation resistance of different LGAD gain layer designs.

I will report on the radiation resistance of 50-micron thick LGAD detectors, manufactured at the Fondazione Bruno Kessler, employing several different types of gain layer. LGAD detectors with gain layer doping of Boron, Boron low-diffusion, Gallium, Carbonated Boron and Carbonated Gallium have been designed and successfully produced. These sensors have been exposed to neutron fluences up to φn ~ $3 \cdot 10^{16}$ n/cm^2 and to proton fluences up to φp ~ $9 \cdot 10^{15}$ p/cm^2 to test their radiation resistance. The data show that Gallium-doped LGAD are more affected by initial acceptor removal than Boron-doped LGAD, while the presence of Carbon reduces the initial acceptor removal for both type of doping. Boron low-diffusion shows a higher radiation resistance than that of standard Boron implant, indicating a dependence of the initial acceptor removal mechanism upon the implant width. This study also demonstrates that proton irradiation is at least twice more damaging than neutron irradiation.

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