Passivation layer and charge collection depth in electronic devices

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Single Event Effects (SEE) are described as system perturbations in electronic devices when impinged by a heavy ion capable of generating high charge density in the sensitive region of the device. Tests of Single Event Effetcs are done using accelerated ions hitting the device at known flux and energy. However, electronic devices possess passivation layers and metallic interconnnections on its surfaces in order to provide electrical isolation/connection of the device that cause energy loss and straggling of incident ions, thus reducing the effective energy transfered to the material and, therefore, charge generation in the active layer. The knowledge of the composition and thickness of these layers are needed for correct calculation of deposited energy in the active region of the device and thus correct characterization of device's sensivity.
In this work, results for ion-induced peak current and collected charge in a p-type MOSFET are shown for several ions and energies, using the SAFIIRA facility at Sao Paulo Pelletron Accelerator, allowing to find the depth of charge collection in the device. Scanning electron microscopy with energy dispersive X-ray and Rutherford Backscattering analysis are used for validation of results obtained. Preliminary results for 28nm digital devices, were only cross section data are avaiable, are also shown.