

Abstract Submitted
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Charge Collection in Irradiated 3D Silicon Sensors ADAM YANEZ, MARTIN HOEFERKAMP, SALLY SEIDEL, University of New Mexico — A new type of particle detector is needed to withstand the high radiation environment at the High Luminosity Large Hadron Collider (HL-LHC). With the planned High Luminosity upgrade, 3D silicon sensors are expected to receive 10 to 20 times more radiation over their lifetime than before. This research examines how bulk damage produced by protons affects charge collection in these sensors. Sensors that exhibit controlled charge multiplication would be able to replace charge lost to radiation-induced traps. The signals they produce may lead to new discoveries in physics. Charge multiplication is measured by taking charge collection measurements of the sensors. Four different geometries of devices are examined, each subjected to varying levels of proton or gamma radiation. Charge collection rates will be measured using beta particles from a Sr-90 source that create electron-hole pairs in the sensor that can be collected. The charge collected can be compared to predicted values to determine whether charge multiplication is occurring. The goal for this project is to observe controlled charge multiplication in small-pitch 3D sensors irradiated with protons at fluences up to 3.0×10^{16} neq.

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