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Predicting the Response of p-type Silicon Sensors to Radiation Environments: a Hamburg Model Simulation

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An overview of the response of p-type silicon sensors to non-ionizing energy loss, accompanied by a new simulation of these effects, is presented. Silicon detection is a mature technology for registering the passage of charged particles. At the same time it continues to evolve toward increasing radiation tolerance as well as precision and adaptability. For these reasons it is likely to remain a critical element of detection systems associated with high energy particle physics experiments. Silicon sensor leakage current and depletion voltage depend upon the integrated fluence received by the sensor, and upon its thermal history during and after the irradiation process. The high energy physics community has gradually shifted to the use of p-type silicon sensors in place of n-type. This will help reduce manufacturing costs and increase radiation tolerance. The Hamburg Model simulation code developed for the prediction of n-type silicon sensors in the experiments at the LHC is being adapted for p-type silicon sensors. The alterations of the model and code base will be discussed.

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