

Study of Low-dose Radiation Resistance of Sidewall Passivation on p-type SCP Devices

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We have been investigating Scribe-Cleave-Passivate (SCP) method of making slim edges on silicon sensors. For n-type devices commonly used dielectrics, such as silicon oxide and nitride, work well and they are radiation resistant. For p-type devices we used alumina (Al_2O_3) for this purpose due to negative interface charge it forms on the border with silicon surface. Our initial radiation tests revealed its potential weakness for low ionizing doses. We investigated this issue with MOS structures with alumina that were irradiated them with gammas and protons. As reported at the last RD50 meeting, we found that interface charge evaluated with the structures evolves with radiation dose in a different manner depending on the details of the processing. We used this knowledge to fabricate 5 groups strip sensors with SCP slim edges. The different groups had different sidewall passivation methods. This included the methods used in the MOS structure studies as well as further process variations that can affect the performance. We irradiated the sensors with gammas at BNL. We will report on their measurements and present our conclusions on the factors affecting the radiation hardness of the silicon surface passivated with alumina.

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