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Power Dissipation Studies on n-in-n Pixel Sensors

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The innermost tracking detector of the ATLAS experiment consists of planar n-in-n pixel sensors. Also the newly installed insertable b-layer (IBL) consists of pixel sensors but with a revised design layout and an improved front-end electronics. The envisaged radiation dose in the run II data taking period of the innermost sensors will be a few $10^{15} n_{eq} cm^{-2}$. Irradiation doses well above $10^{16} n_{eq} cm^{-2}$ are considered for innermost pixel detector layers in future collider and detector upgrades like the high luminosity LHC (HL-LHC).

This contribution presents the results of a systematic study of power dissipation, which has been performed on several n-in-n single chip sensors, irradiated to fluences up to $2 \times 10^{16} n_{eq} cm^{-2}$ as well as on all main structures of a non-irradiated IBL prototype wafer. Measurement parameters include variations of sensor bias voltages, operation temperatures, bulk thicknesses and irradiation fluences.

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