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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 at CERN-LHC consists of planar n-in-n pixel sensors with FE-I3 front-end electronics as hybrid. Also the newly installed insertable b-layer (IBL) at the ATLAS experiment consists of pixel sensors with a revised design layout and an improved FE-I4 front-end electronics. The envisaged radiation dose in the run II data taking period of the innermost sensors will be a few 10^{15} Neutrons (1 MeV equivalent) cm^{-2} . Irradiation doses well above 10^{16} n cm^{-2} are considered for innermost pixel detector layers in future collider and detector upgrades like the high luminosity LHC (HL-LHC).

In this contribution aspects of R&D laboratory investigations employing measurements of non-irradiated and irradiated n-in-n pixel sensor structures are discussed. Main focus is a systematic study of power dissipation for n-in-n pixel sensors. Measurement parameters include variations of bulk thicknesses, sensor bias voltages, operation temperatures, and irradiation fluences.

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