

E-TCT characterisation of neutron irradiated 180 nm HV-CMOS pixel test structures

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MuPix8/ATLASPix1 are two large area monolithic pixel detectors for the Mu3e experiment at PSI and the ATLAS ITk upgrade respectively. They were manufactured together in the ams AG 180 nm HV-CMOS process (aH18) as part of the same engineering run (~ 2 cm x 2 cm total area). This engineering run also includes a few passive pixel test structures.

Presented in this work are I-V characteristic curve and edge-Transient Current Technique (e-TCT) measurements of two sets of such passive pixel test structures. The first set are 80 Ω -cm nominal substrate resistivity samples, that are topside biased. The second set are 200 Ω -cm nominal substrate resistivity samples that have been thinned to 300 μ m and backside processed to allow backside biasing. In both cases, measurements include samples irradiated with neutrons to fluences up to $1E16$ 1 MeV neutron equivalent fluence and up to $2E16$ 1 MeV neutron equivalent fluence for the thinned, backside biased samples.

Measurements of the depletion depths of both sets of samples made using e-TCT are used to estimate the effective doping concentration. The evolution of effective doping concentration is then studied as it changes with neutron equivalent fluence.

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