

Beta Source Tests of Semiconductor Detectors ITk for ATLAS Upgrade

Abstract: The ATLAS experiment is due to undergo a major upgrade for the High Luminosity phase of the LHC operation. In particular, the current tracking system (ID) will be replaced by full-silicon ITk. IPNP laboratories are involved in R&D of SCT detector modules for ITk. Low-temperature β -source tests of the R0_FR_5 module prototype were the main focus of this thesis. After testing the cooling cycle, 11 threshold scans were performed on two ABC130 chips, yielding the median collected charge ranging between 2.9 ± 0.2 fC and 3.1 ± 0.2 fC for chip #6 at SNR from 16.0 ± 1.0 at 24°C to 22.7 ± 1.5 at -15°C . No trend with temperature was observed outside the error bars. The results are in accordance with previous similar measurements. Question of fitting the median collected charge in various units was addressed and equivalence of the fits was determined. The ability of IPNP laboratories to perform low-temperature β -source tests was proven.