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P85 - Sharing effects in the inter-strip gap of DSSSDs

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Double Sided Silicon Strip Detector (DSSSD) are commonly used for detection of charged particles in nuclear and particle physics experiments. The front and back side surfaces of these devices are segmented into strips with a strip-to-strip separation, called "inter-strip gap".

Phenomena as charge sharing, recombination and trapping effects are observed for charged particles hitting the region nearby the inter-strip gap. Moreover, inverted polarity pulses can be produced by adjacent strips affecting the charge induced on electrodes. Previous studies of the inter-strip effects have been performed by using alpha-particles of low energies [1, 2], 3 MeV protons [2], 59.5 keV gamma-rays from a ^{241}Am source [3], laser beams [4, 5] and, more recently, ^7Li and ^{16}O beams of energies between 6 and 50 MeV [6]. These experiments confirmed that the efficiency for full energy reconstruction is sensitive to the experimental working conditions.

The response of two DSSSDs (75 μm and 998 μm thick) was studied by the Ion Beam Induced Charge (IBIC) technique at the Ruder Bošković Institute in Zagreb. It was found that protons of different energies hitting the inter-strip gap induce different effects on the generation of signals. Results show that the behaviour of signals induced in the inter-strip region is related with the penetration depths of the protons and the detector bias voltage. The effective inter-strip width is defined and measured and the trend is discussed.

[1] Y. Blumenfeld, et al., NIM A 421 (1999) 471.

[2] J. Yorkston et al., NIM A 262 (1987) 353.

[3] S. Takeda, et al., NIM A 579 (2007) 859.

[4] T. Poehlsen, et al., NIM A 700 (2013) 22.

[5] V. Eremin, et al., NIM A 500 (2003) 121.

[6] D. Torresi, et al., NIM A 713 (2013) 11.

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