

New time pick-off algorithm for time-of-flight measurements with PIN diodes

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Use of PIN diodes in spectrometry of low heavy ions poses some methodological challenges. One of them is correctly accounting for the so-called plasma delay effect (PDE) which is due to generation of plasma in a heavy ion track in the PIN diode. The PDE prevents precise measurements of a particle's time-of-flight (TOF). In this presentation, we discuss new algorithm of time pick-off when using Si PIN diodes for measuring time-of-flight of heavy ions. The algorithm implies that the signal is split into two parts: the first part is approximated with a parabola which vertex coincides with the start of the signal and lies on the averaged baseline; and the second part is approximated by smoothing spline function. The proposed algorithm was experimentally verified with data acquired using two time-of-flight spectrometers, one with ^{252}Cf source and another one, installed at IC-100 accelerator (FLNR, JINR). The results demonstrate that the developed algorithm allows obtaining unbiased fission fragment's mass for the wide range of ion's masses and energies, and thus provides a reliable "true" pick-off time for PIN diodes when used as time detectors.

Primary author: GORYAINOVA, Zoya (Joint Institute for Nuclear Research)

Co-authors: KAMANIN, D.V.; PYATKOV, Yu.V.; ZHUCHKO, V.E.; ALEXANDROV, A.A.; STREKALOVSKY, A.O.; ALEXANDROVA, I.A.; KORSTEN, R.; KUZNETSOVA, E.A.; STREKALOVSKY, O.V.; FALOMKINA, O.V.; PYT'EV, Yu.P.

Presenter: GORYAINOVA, Zoya (Joint Institute for Nuclear Research)

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