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THE USE OF THE PSA METHOD IN THE INTERPRETATION OF THE BEHAVIOR OF CURVES ON THE △E-E DIAGRAMS FOR TELESCOPE OF THE Si - DETECTORS.

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PSA method (pulse shaping analyze) widely used in nuclear physics experiments and radiation detection [1]. This method was first proposed in 1963 (S. Barlini), but is still being developed by many scientists. A wide variety of pulse features have been extracted to realize this method. Many ways to implement the PSA method have been proposed, mainly to determine the type of particle (for example, the charge integration method, the charge balance parameter method that have been widely used in n/γ discrimination into PSA). Concerning the use of silicon detectors, for example, in the 1970 opportunity was found to discriminate the proton and the alpha particles by rise time of the pulse and so more.

This article proposes a variant of the PSA method and a specific area of its application. The operation of the method is demonstrated on the information obtained in the study of the reaction $d + {}^{2}\mathrm{H} \longrightarrow p + p + n + n$, that was performed using deuteron beam with energy of 15 MeV at the SINP MSU. The measurement system mainly consisted of a set of ORTEC totally depleted silicon surface barrier detector (25, 300, 400 μm), a Canberra 2003BT pre-amplifier (or ORTEC H242A, 142A) and a CAEN DT5742 and 5720 digitizer. EJ301 detectors was registered neutrons in the other arm of setup. The preamplifiers used had fast signal outputs. These signals are required for the TOF system to function and are obtained by processing of the main signals. Waveforms of all signals were digitized by digitizers. For each event from the silicon telescope, its position on the ΔE–E diagram was analyzed depending on the duration of the leading, trailing edges and the amplitude of the fast signal.

It was shown that taking into account the shape of a fast signal in the form of edge durations makes it possible to unambiguously determine whether an event belongs to the forward or reverse course of the curves on the ΔE–E diagram. In the case of intense spots on such curves, this helps in the analysis of experimental information. This is necessary in the case of using silicon telescopes consisting of several detectors located in the air. Especially interesting has the dependence of the trailing edge of the signal on the fact of the passage of the particle through the detector.

1. Jin-Tao Zhu et al., Chin. Phys. C. V.40, № 40. P.036202. (2016).
2. S.V.Zuyev et al., Bull. Russ. Acad. Sci.: Phys. V.80. №3. P.227. (2016).

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