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Development of the new spectrometric channel for the SND electromagnetic calorimeter

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The Spherical Neutral Detector (SND) [1] is intended for study of electron-positron annihilation at the VEPP-2000 e+e- collider (BINP, Novosibirsk) [2]. The main part of the SND detector is a three-layer electromagnetic calorimeter (EMC). The EMC consists of 1640 counters. Each counter includes a NaI(Tl) crystal, a vacuum phototriode [3], and a charge-sensitive preamplifier.

Currently the EMC electronics is being upgraded [4]. It is needed, in particular, to provide reliable detection of slow anti-neutrons produced in the $e^+e^- \rightarrow n \text{ anti-}n$ reaction near threshold. The electronics must have the time resolution of about 1 ns or better [5] and good amplitude resolution.

The new shaping module F12M has been developed to achieve optimal signal shape for best time and amplitude resolution. The new FADC module provides digitizing and processing of the measured oscillogram. The signal arrival time and amplitude are determined from the fit to the measured signal shape using a specially developed algorithm. The time resolution achieved is about 1 ns, while the amplitude resolution is about 250 keV.

The developed approaches in electronics design and fitting algorithms may be used in calorimeter electronics of the detector for the Super c-tau Factory.

References

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