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Garfield/LTSpice studies of the straw tube time and charge resolution for various readout parameters

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The report is dedicated to detailed simulation studies of different options of the straw drift tubes readout electronics aiming the best performance of the SPD Straw Tracker. The Straw Tracker of the SPD detector should provide track coordinate measurements and also should serve the Particle Identification of low momentum charged particles. This requires simultaneous precise measurement of the signal time and charge, so optimization of the readout electronics parameters is necessary.
Garfield++ package is used to generate a realistic straw response signal. The readout electronics response is modeled using LTSpice. Different parameters, such as the preamplifier gain, shaper peaking time, discriminator threshold and electronics noise level are studies.
Visual forms of signals and quantitative distributions are obtained. The drift time distributions for various discriminator threshold levels and shaper peaking times are analyzed in order to reach the best tracking performance. Influence of the peaking time on the precision of the charge measurements is studied as well. Comparison of experimental data and the modeling results is presented.

Author: BULANOVA, Sofia (NRC KI PNPI)

Co-authors: LAPKIN, Aleksandr (JINR); GUROVA, Alexandra (MEPhi); SOSNOV, Dmitry (NRC KI PNPI); KUZNETSOVA, Ekaterina (NRC KI PNPI); ROMAKHOV, Sergey (JINR); ENIK, Temur (JINR); BAUTIN, Vitalii (JINR)

Presenter: BULANOVA, Sofia (NRC KI PNPI)

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