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Open charm measurements at CERN SPS energies with the new Vertex Detector of the NA61/SHINE experiment - status and plans

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The study of open charm meson production provides an efficient tool for detailed investigations of the properties of hot and dense matter formed in nucleus-nucleus collisions. The interpretation of the existing data from the CERN SPS suffers from a lack of knowledge on the total charm production rate. To overcome this limitation the heavy-ion programme of the NA61/SHINE experiment at CERN SPS has been expanded to allow for precise measurements of particles with short lifetime. A new Vertex Detector, based on the MIMOSA pixel chip family, was designed and constructed to meet the challenges of open charm measurements in nucleus-nucleus collisions.

A small-acceptance version of the Vertex Detector, SAVD (Small Acceptance Vertex Detector), was installed in December 2016 for data taking with Pb+Pb collisions at 150A GeV/c, and an exploratory set of data was collected. From this data a hint of a D_0 signal was extracted in the $\pi+K$ decay channel. This might be the first, direct observation of open charm in nucleus-nucleus collisions at SPS energies.

The physics motivation behind the open charm measurements at the SPS energies will be discussed. Moreover, the concept of the SAVD hardware and status of the analysis will be shown, discussing challenges related to the tracking in the inhomogeneous magnetic field, as well as the matching of SAVD tracks to TPCs tracks needed for the extraction of physics results. Also, the future plans of open charm measurements in the NA61/SHINE experiment related to the upgraded version of the Vertex Detector will be presented.

Author: MERZLAYA, Anastasia (St Petersburg State University (RU), Jagiellonian University (PL))

Presenter: MERZLAYA, Anastasia (St Petersburg State University (RU), Jagiellonian University (PL))

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