A New Silicon Drift Detector System for Kaonic Atom Measurements

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Kaonic atoms provide a unique way to study the strong interaction in bound systems [1],[2],[3],[4]. The proposed kaonic deuterium measurement at J-PARC [5], [6] and DAΦNE [7] will add important results to the already existing kaonic hydrogen analysis, adding in particular values for the determination of the antikaon-nucleon scattering lengths a_0 and a_1 by measuring the energy shift and width of the 1s state. Additionally, the planned kaonic helium experiment at J-PARC will give new insight in the possible isotope shift between He-3 and He-4 [8].

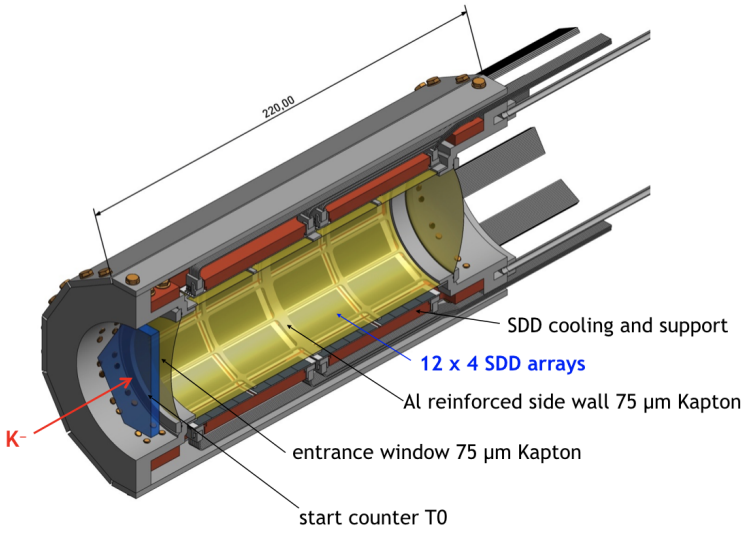

Figure 1: Sketch of the lightweight cryogenic target cell surrounded by 48 SDD arrays

For the kaonic deuterium measurement the 2p→1s shift will be measured by 48 SDD arrays surrounding a cryogenic target cell (see Figure 1). With newly developed amplifiers and specially designed Silicon Drift Detectors the shift and width of the 1s state can be measured with an accuracy better than 50 eV and 100eV, respectively. The SDDs have undergone several tests at the Stefan Meyer Institute concerning their energy resolution and stability. The latest tests have been performed to determine the timing resolution (drift time) of the SDD arrays, achieving a drift time below 500 ns at 150 K. Tests at lower temperature to reduce the drift time below 200 ns are planned in the near future.

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[5] J. Zmeskal *et al.*, JPS Conf. Proc. **17** (2017) 071001
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