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Precision X-ray Measurements with Silicon Drift Detectors in the SIDDHARTA-2 Experiment

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The SIDDHARTA-2 experiment at the DAΦNE collider aims to perform high-precision X-ray spectroscopy of exotic atoms to study the low-energy strong interaction in the strangeness sector. The experiment employs large-area Silicon Drift Detectors (SDDs) with a thickness of 450 µm, optimised for detecting soft X-rays. To extend the accessible energy range and enable precision measurements of higher-energy transitions (up to several tens of keV), the development of new 1 mm thick SDDs is currently underway.

In this contribution, we present the ongoing characterisation of the 1 mm SDD prototypes in a dedicated laboratory setup. The detectors are tested at various bias voltages to evaluate their response, energy resolution, and overall performance for high-energy X-ray detection. Understanding the optimal working conditions for these thicker sensors is essential for their future integration into the experimental apparatus.

Additionally, we report on an exploratory measurement carried out with the current 450 µm SDDs using a C2F4 solid target to measure, for the first time, transition lines of Kaonic Fluorine. The results demonstrate the feasibility of high-energy X-ray detection with the existing setup and provide a benchmark for comparison with the new detector generation.

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