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Development of a cryogenic x-ray detector and an application for kaon mass measurement.

The ASPE!CT project (a collaboration of industrial and research companies, and the Stefan-Meyer Institute in Vienna) aims to develop a commercially viable, cryogenic detector platform. The first phase of the project will produce a cryogen-free, single-stage, adiabatic demagnetisation refrigerator for use at ~500mK. The project aims to advance the technology into the realm of reliable, compact, black-box, touch-button devices, which can be used for a wide range of cryogenics sensors. Later stages of the project will push the temperature range to 30mK, and introduce continuous, high-power, low-temperature cooling.

At the Stefan-Meyer Institute, we plan to use the detector system to make an improved measurement of the mass of the kaon. Though the kaon mass is an essential input for strangeness hadron physics, it is determined as an average of two largely separated measurements (~3 sigma, 60 eV) [1]. To this end we will be testing various designs of cryogenic detectors working at 500mK with a view to achieving the necessary resolution at ~10 keV x-ray energies created in kaonic atoms. Later stages of the project should see lower temperatures and higher resolutions, with improved count rates in an optimised experimental set-up.

additional information

[1] K.A. Olive et al. (Particle Data Group), Chin. Phys. C, 38, 090001 (2014).

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