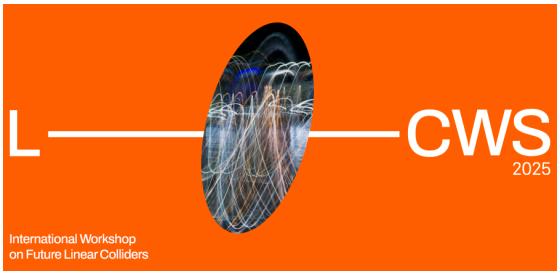

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HTS NI Adiabatic Matching Device for PSI Positron Production Experiment

Wednesday 22 October 2025 10:30 (20 minutes)

This contribution presents the system design and commissioning of the first Adiabatic Matching Device (AMD) magnet built and tested in-house at Paul Scherrer Institute (PSI) using Non-Insulated (NI) High Temperature Superconducting (HTS) technology for the PSI Positron Production (P3) Experiment.

The P3 project is the proposed proof of principle experiment for the FCC-ee planned to start in Q3 2026, aims to demonstrate a high-yield positron source. One of the most challenging elements of the experiment is the capture solenoid magnet around the target, which generates adiabatically tapered solenoidal magnetic field to match the beam emittance to input acceptance of the accelerating section. To meet the requirements of the experiment, a novel approach using HTS NI coils is proposed.

This technology takes advantage of the high current density, high stability, and relatively straightforward cryogen-free cooling, producing considerably higher positron yield with respect to the state of the art based on pulsed normal conducting magnets. Conventional insulation could be subject to irradiation damage and constitute a thermal barrier for the extraction of heat from the coil. These aspects together make solder-impregnated coils ideally suited for compact DC applications.

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