



Superconductivity for
Sustainable Energy Systems
and Particle Accelerators



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Test Stand for Energy-Responsible Accelerator Systems

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The Compact Accelerator Systems Test Stand (COMPASS) currently under construction at KIT provides a versatile experimental environment for the development of energy-responsible accelerator systems. COMPASS comprises a cryostat vessel with a cubic cryogenic installation space of 50 cm edge length and a power supply providing electrical currents between a few 100 A up to 10 kA. It is equipped with a 2-stage pulse tube cryocooler for shield cooling and for LTS applications operated at 4 K, as well as two cryogenic mixed-refrigerant cycles (CMRCs) for the cooling of HTS applications between 20 K to 77 K. The CMRCs cover a wide capacity range for component developments and can be combined in a cascade to achieve low temperatures.

The most favorable application of CMRC technology is current leads of high-current superconducting applications, inducing a/the major heat load through their resistive part between 300 K and 77 K and thus often dominating operating cost. While cryocoolers can only pick up the heat load at the cold end, CMRCs gradually absorb the heat at the highest possible temperature along the entire current lead length, approaching the thermodynamic optimum. This may reduce the power consumption of current lead cooling by 2/3 and the power consumption of stand-alone cryostats up to 50 %, respectively.

We present the status of COMPASS, the prototype development of CMRC-cooled micro-structured current leads, and our plans for testing this new technology in combination with various HTS- and LTS-applications in the future.

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