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Stand-alone operation of the dual-core cryogenic current comparator for FAIR

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The Cryogenic Current Comparator (CCC) is a superconducting device for measurement of extremely weak currents with magnetic fields in the range of fT. It uses a Superconducting Quantum Interference Device (SQUID) as an ultrasensitive magnetometer and an elaborated superconducting shield for its protection from external magnetic fields. The system is operated in a helium bath cryostat, which has to fulfill many requirements, such as being non-magnetic, pressure/temperature stable (mK), vibration dampening, UHV fit, bakable, compact and accessible for maintenance and repair.
First operation of a CCC as beam current monitor was achieved in the 90s at GSI. The idea has been updated for measurement of slow extracted beams and exotic ions at FAIR, and since 2014 there has been steady optimization by an international collaboration of expert institutes. Looking at noise figures and current resolution as well as practical applicability and costs, a Dual-Core CCC (DCCC) has turned out as best candidate for FAIR. In parallel to detector development the cryostat has been investigated and improved. It has recently achieved stand-alone operation, which is a main requirement for FAIR.

Footnotes

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