

# The Cryogenic Current Comparator (CCC) for nondestructive spill measurement in the nA range

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The Cryogenic Current Comparator (CCC) is a SQUID based superconducting device for intensity measurement, which has first been proposed as a beam diagnostics in the mid 90s at GSI. In the course of plannings for FAIR the CCC has been revitalized as intensity monitor for exotic/highly charged ions and antiprotons in the storage rings as well as for slow extracted beams in the extraction and experimental lines. Since 2014 systematic investigations have been carried out within a dedicated collaboration, which led to improvements of detector and cryostat, resulting in nA spill measurements with a prototype at GSI and in the following installation of a CCC in CERN Antiproton Decelerator (AD).

The optimization process of the device is ongoing, with respect to varying operating conditions, system robustness, current resolution and last not least system costs. Due to the planned realization steps of the FAIR facility, the application of the CCC for online spill measurement and analysis has moved into the foreground now. In the first stage of FAIR, CCCs will be installed at SIS18 extraction and in front of SFRS, one of the two devices is already in operation at GSI and tested in the 2023 run. We will show some results from beam measurements and present an overview of CCC development, focused on the possibilities for online analysis of slow extracted beams.

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