

Mechanical Perturbations on SQUID based Cryogenic Current Comparator (CCC) - Measurements

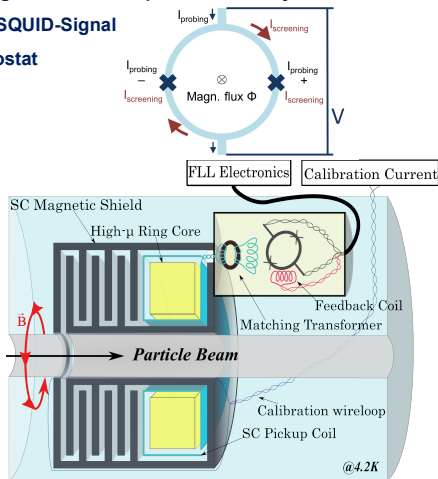
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The Cryogenic Current Comparator (CCC) extends the measurement range of traditional **non-destructive** current monitors down to a few **nano-amperes** using a superconducting magnetic field sensor (SQUID). The SQUID-signals are disturbed by different perturbation sources. One of them is the mechanical perturbation of SQUID-measurement, which is introduced by different parts of CCC components. With an accelerometer the vibration signals by CCC will be received and compared with SQUID signals to take improvements

Features

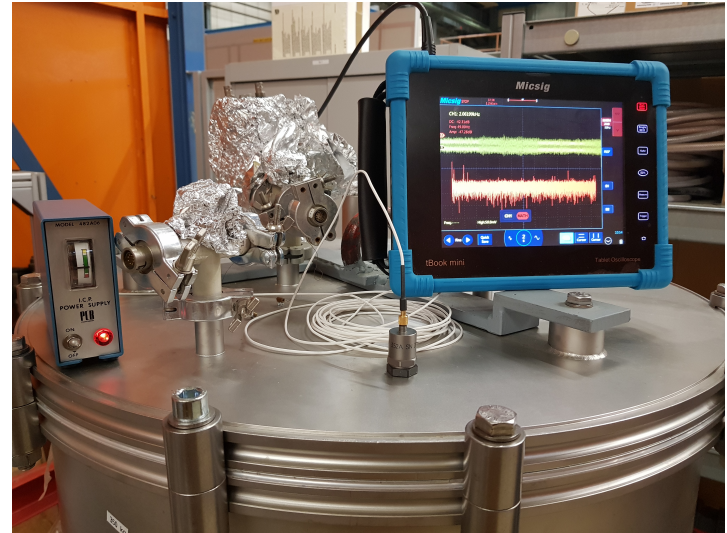
- Measurement and analysing of mechanical perturbations by CCC
- Influence of Vibrations on SQUID-Signal
- Improvements by new Cryostat



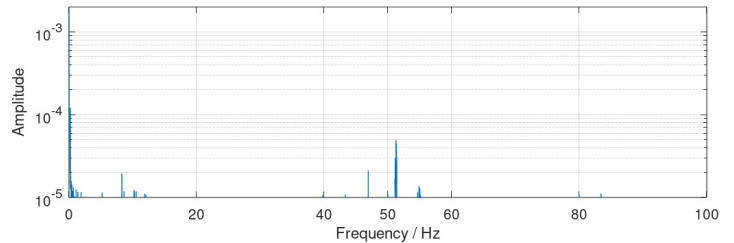
- Superconducting magnetic shield – Field selection
- Superconducting pick-up coil – Signal transfer
- DC-SQUID – Measurement (Superconducting Quantum Interference Device)

Vibration analysis

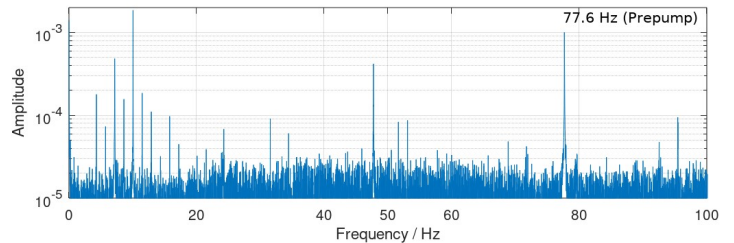
- Mechanical vibrations lead to current noise: $> 30 \text{ pA}/\sqrt{\text{Hz}}$ (5 - 100 Hz)
- An accelerometer is mounted on the surface of cryostat (Figure top right)
- The vibration signals are compared with SQUID-signals (Figure bottom right)
- Mechanical perturbations from CCC components will identified (Figure bottom left)
- Spout holder an improvement for reliquefier coupling (Figure top left) will compared with vibrations on CCC-surface (Figure on right-hand side)



Mechanical Perturbation on CCC-Cryostat without Reliquefier & Prepump

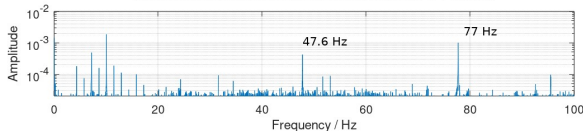


Harmonic Multiples of 1.4 Hz (Reliquefier)
Mechanical Perturbation on CCC-Cryostat While Reliquefier & Prepump

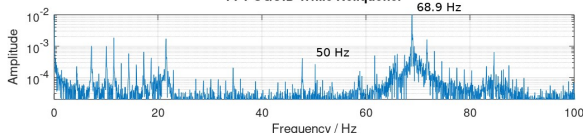


Comparison between the inactive state and operation state of reliquefier and prepump by CCC cryostat

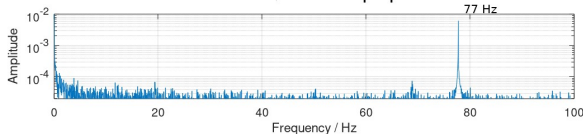
Vertical Vibration Measurement While Reliquefier & Prepump



Harmonic Multiples of 1.4 Hz FFT SQUID While Reliquefier

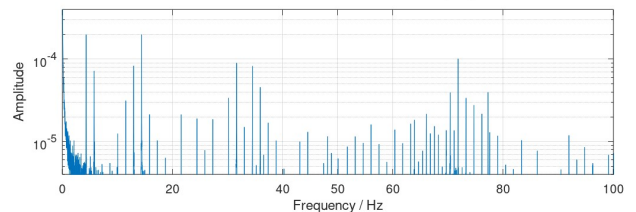


FFT SQUID While Prepump

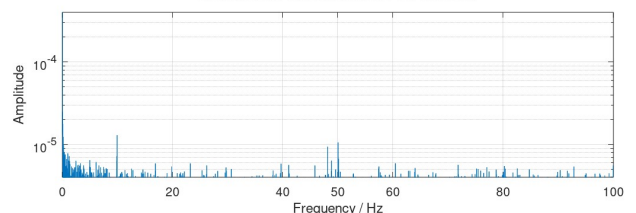


Comparison of vibration signals during the operation of reliquefier and pre-pump with each SQUID spectra. The harmonic multiples of 1.4 Hz caused by reliquefier and the operating frequency 77 Hz of the pre-pump are also seen through SQUID spectra.

caused by reliquefier
Harmonic Multiples of 1.4 Hz
Mechanical Perturbation on CCC-Coupling



Mechanical Perturbation on CCC-Cryostat



Comparison of vibrations from cryostat (bottom) and from reliquefier coupling (top)