INVITED

IN SI-2

Progress in dc SQUID Readout Electronics

Dietmar Drung
Physikalisch-Technische Bundesanstalt (PTB), Berlin, Germany

The overall performance of a SQUID system is decisively determined by the quality of the readout electronics. This electronics performs two main functions: it amplifies the small SQUID signal to an acceptable level without adding a significant amount of noise, and it linearizes the transfer function of the SQUID in order to provide sufficient dynamic range. For well designed electronics, the system noise approaches the intrinsic noise of the SQUID. In contrast, the dynamic performance (bandwidth, slew rate) is usually limited by the readout electronics rather than by the SQUID itself. Although in many cases the signals of interest are slow (e.g., in biomagnetism) a high dynamic performance is often required in order to enable an unshielded operation of the SQUID. In other applications such as nuclear magnetic resonance (NMR) or the readout of cryogenic detectors, the signals of interest require fast SQUID electronics.

In the first part of my talk, the fundamentals of SQUID readout electronics will be briefly reviewed including a discussion of noise and dynamic behavior of a general SQUID system. In the second part, the latest developments in SQUID electronics will be presented: the reduction of electronics size and power consumption for biomagnetic multichannel applications and the increase of system slew rate, bandwidth and dynamic range for unshielded or wideband applications.

keywords : SQUID, readout electronics, noise, slew rate, bandwidth