dc SQUID – SQIF Sensor with High Transfer Function Based on Sub-micrometer Cross-type Josephson Tunnel Junctions

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Abstract - The sensor, called herein GHS, is based on a dc SQUID connected to a SQIF that amplifies the voltage from the first stage SQUID. The SQIF consists of an array of SQUIDs with various inductances, facilitating a unique global minimum in the flux-voltage-characteristic and ensures a stable working point, a high voltage swing and a large transfer function of the GHS. Sub-micrometer cross-type Josephson junctions are used for the GHS. Due to their low capacitance, the sensors exhibit low magnetic flux noise and a high voltage swing. The voltage swing of the SQIF can exceed 3 mV which enables us to use of a high-bandwidth directly coupled SQUID electronics. Part of the current of the SQIF can be optionally fed back to the input coil of the first stage SQUID, so that an on-chip linearization is realised. The used sub-micron cross-type junctions withstand high background fields during cool-down of up to 6.5 mT. The high voltage swing as well as the optional on-chip linearization make this setup well suited for applications in strong magnetic fields where high slew rates are required, like, e.g., the transient electromagnetic method (TEM) used in geomagnetic exploration.

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