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HTS-SQUID module with high tolerance to magnetic field and its application

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We developed an HTS-SQUID module applicable to various systems [1]. The SQUID module was designed to connect an external pickup coil suitable for each application. The hermetically encapsulated SQUID module includes an HTS planar gradiometer and an HTS multi-turn input coil, which are fabricated on separate substrates and stacked together. Since the SQUID module can be magnetically shielded to avoid exposure to external magnetic field, a stable feedback operation is possible under severe conditions such as strong excitation field and/or motion in the Earth's field. The SQUID modules have been used in a bioassay system based on ac magnetic susceptibility measurement [2], moisture content measurements of rice kernels and soil utilizing diamagnetic characteristics of water [3], magnetic particle imaging [4, 5] and so on. Recently, we have developed a three-channel SQUID eddy current testing (ECT) system on a hand cart for detection of a fatigue crack in a steel deck plate under an asphalt pavement used in an expressway bridge [6]. We could demonstrate a stable long-time operation of the ECT system on an expressway bridge in an urban area during the daytime and acquisition of correct data corresponding to some structural features of the expressway bridge.

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