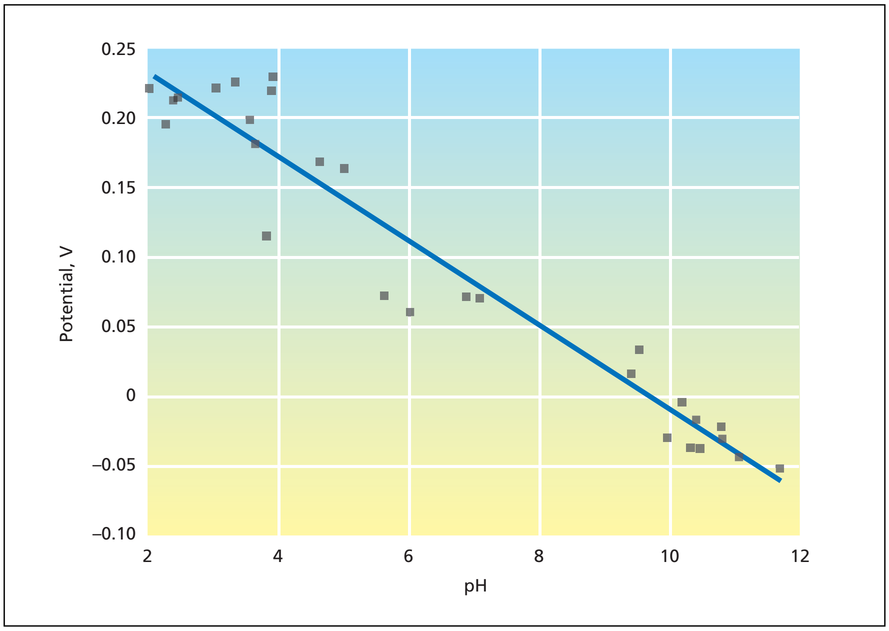

Differences Between the Potentials of an iridium/iridium oxide electrode and a rhodium/rhodium oxide electrode were measured when the electrodes were in equilibrium with solutions having several different pH values.

the potentials of the two electrodes was measured as a function of pH, the slope was found to be about –30 mV/pH (see figure). This slope is well within the range of typical instrumentation used in converting DC signals to digital data for recording.

This work was done by William West, Martin Buehler, and Didier Keymeulen of Caltech for NASA's Jet Propulsion Laboratory.

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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Refer to NPO-43338, volume and number of this NASA Tech Briefs *issue, and the page number.*

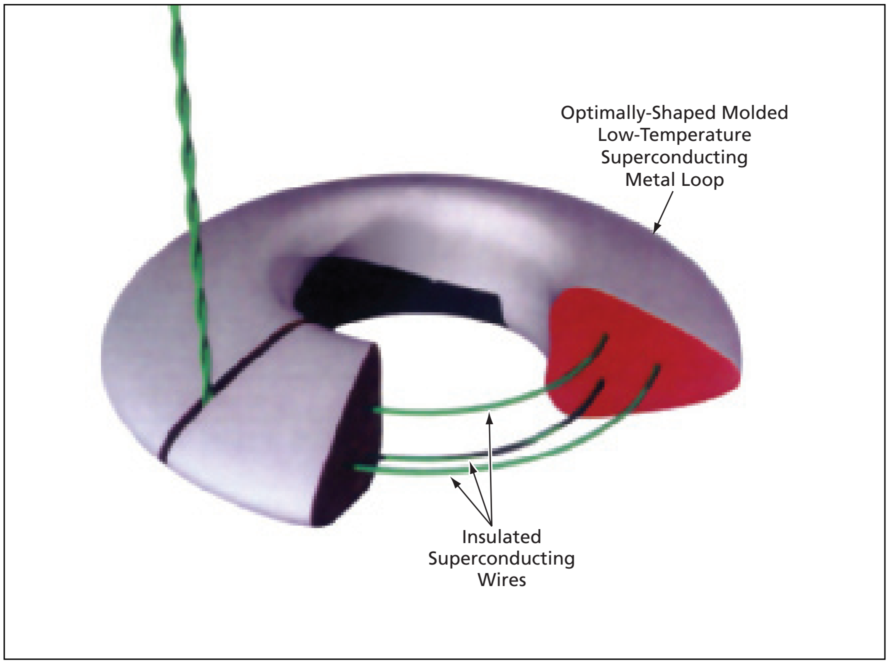
Improved Sensing Coils for SQUIDs

Coils would be molded on outer surfaces of forms encapsulating superconducting wires.

NASA's Jet Propulsion Laboratory, Pasadena, California

An improvement in the design and fabrication of sensing coils of superconducting quantum interference device (SQUID) magnetometers has been proposed to increase sensitivity. It has been estimated that, in some cases, it would be possible to increase sensitivity by about half or to reduce measurement time correspondingly.

The pertinent aspects of the problems of design and fabrication can be summarized as follows: In general, to increase the sensitivity of a SQUID magnetometer, it is necessary to maximize the magnetic flux enclosed by the sensing coil while minimizing the self-inductance of this coil. It is often beneficial to fabricate the coil from a thicker wire to reduce its self-inductance. Moreover, to optimize the design of the coil with respect to sensitivity, it may be necessary to shape the wire to other than a commonly available circular or square cross-section. On the other hand, it is not practical to use thicker superconducting wire for the entire superconducting circuit, especially if the design of a specific device requires a persistent-current loop enclosing a remotely placed SQUID sensor. It may be possible to bond a thicker sensing-coil wire to thinner superconducting wires leading to a SQUID sensor, but it could be difficult to ensure reliable superconducting connections, especially if the bonded wires are made of different materials.



A **Single-Turn Sensing Coil** would be made by melting a low-melting-temperature superconducting metal onto a form encapsulating three insulated superconducting wires.

The proposed improvement would constitute a partial solution of some of the problems summarized above. The main idea is to mold the sensing coil in place, to more nearly optimum cross sectional shape, instead of making the coil by winding standard prefabricated wire. For this purpose, a thin superconducting wire loop that is an essential part of the SQUID magnetometer would be encapsulated in a form that would serve as a mold. A low-melting-temperature superconducting metal (e.g., indium, tin, or a lead/tin alloy) would be melted into the form, which would be sized and shaped to impart the required cross section to the coil thus formed. The figure depicts an example of a design incorporating the proposed improvement.

This work was done by Konstantin Penanen, Inseob Hahn, and Byeong Ho Eom of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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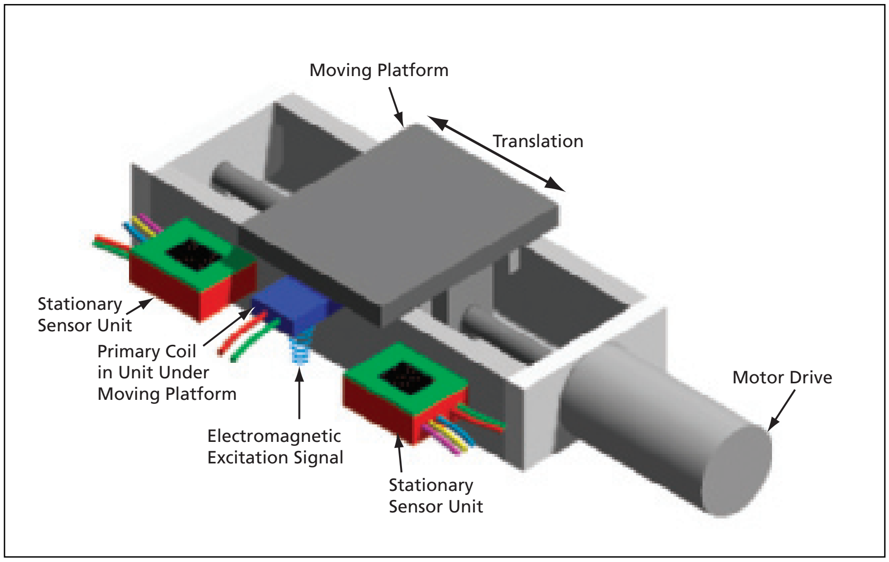
Refer to NPO-44397, volume and number of this NASA Tech Briefs *issue, and the page number.*

Inductive Linear-Position Sensor/Limit-Sensor Units

These non-contact devices afford more information than do mechanical limit switches.

Marshall Space Flight Center, Alabama

A new sensor (see figure) provides an absolute position measurement. The figure presents a schematic view of a motorized linear-translation stage that contains, at each end, an electronic unit that functions as both (1) a non-contact sensor that measures the absolute position of the stage and (2) a non-contact equivalent of a limit switch that is tripped when the stage reaches the nominal limit position. The need for such an absolute linear position-sensor/limit-sensor unit arises in the case of a linear-translation stage that is part of a larger system in which the actual stopping position of the stage (relative to the nominal limit position) must be known. Because inertia inevitably causes the stage to run somewhat past the nominal limit position, tripping of a standard limit switch or other limit sensor does not provide the required indication of the actual stopping position. This innovative sensor unit operates on an electromagnetic-induction principle similar to that of linear variable differential transformers (LVDTs).



A **Linear Translation Stage** is equipped with linear-position-sensor/limit-sensor units.

Depending upon the application, this sensor technology can provide absolute position in various forms and can easily be integrated into users' designs. The basic sensor utilizes only two active inexpensive components. The sensor can be placed on an adhesive surface, or could be buried inside or underneath the outer skin of a component. The sensor technology can be physically scaled up or down and can even be employed inside a microelectromechanical-system (MEMS) device. The sensor can be designed with redundant sensor coils without additional physical volume.

In testing, the sensor produced accuracies of 4 μm, and greater accuracies are possible with other sensor configurations. The sensor can use excitation frequencies ranging from several kilohertz to the megahertz region. The sensor is extremely repeatable with data correlations of 0.99999 or greater. This simple sensor technology has been patented and is available for licensing opportunities.

This work was done by Dean Alhorn, David Howard, and Dennis Smith of Marshall Space Flight Center and Kenneth Dutton of Sverdrup Technology, Inc. Further information is contained in a TSP (see page 1).

This invention has been patented by NASA (U.S. Patent No. 7,116,098). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to Sammy Nabors, MSFC Commercialization Assistance Lead, at sammy.a.nabors@nasa.gov. Refer to MFS-32192-1.