Precision Magnetometer for More Accurate Magnetic Field Readings

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an improved magnetic resonator system that reduces the effect of the magnetic fields of alkali atoms for more accurate and precise magnetometers.

OVERVIEW

A magnetometer is a scientific instrument used to measure the strength and/or direction of magnetic fields. It has applications in areas such as navigation systems, geophysics and drilling/mining exploration. Magnetometers use noble gas atoms, which are polarized by spin-exchange with optically pumped alkali atoms. Industrial laboratories have developed nuclear magnetic resonance (NMR) oscillators, which are precision magnetometers; however, the magnetic field produced by the alkali atoms in these oscillators provides a major source of systematic error and noise. A new magnetic resonator that alleviates these limitations is needed.

THE INVENTION

UW–Madison researchers have developed a method and apparatus for measuring the magnetic resonance of noble gas nuclei in a magnetic field. Their discovery reduces the effects of the magnetic field produced by the alkali atoms.

The system comprises a chamber holding an intermixed noble gas and an alkali gas exposed to a magnetic field external to those generated by the gases. A spin aligner acts on the alkali gas to promote a precession of a magnetic moment of the alkali gas so that a time-averaged angular difference is essentially zero. Precise measurements are obtained by constraining the time-averaged direction of the spins of a stimulating alkaline gas to lie in a plane perpendicular to the magnetic field. Additionally, a monitor outputs a signal indicating the precession frequency of the noble gas.

THE WARF ADVANTAGE

Since its founding in 1925 as the patenting and licensing organization for the University of Wisconsin-Madison, WARF has been working with business and industry to transform university research into products that benefit society. WARF intellectual property managers and licensing staff members are leaders in the field of university-based technology transfer. They are familiar with the intricacies of patenting, have worked with researchers in relevant disciplines, understand industries and markets, and have negotiated innovative licensing strategies to meet the individual needs of business clients.
APPLICATIONS

• Precision fundamental physics research
• Spacecraft navigation
• Geomagnetism
• Oil exploration
• NMR gyro applications

KEY BENEFITS

• More accurate magnetic field readings
• Provides effective controlled alignment of the magnetic moments of the alkali gas, thus suppressing the alkali magnetic fields
• Provides an improved gyroscope or magnetometer
• Simple method of measuring the noble gas precession

STAGE OF DEVELOPMENT

Modeling and simulations have been carried out.

ADDITIONAL INFORMATION

Tech Fields
Analytical Instrumentation - Sensors

CONTACT INFORMATION

For current licensing status, please contact Emily Bauer at emily@warf.org or 608-960-9842.