



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.

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

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Stage of Development

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Modeling and simulations have been carried out.

Additional Information

For More Information About the Inventors

- [Thad Walker](#)

Related Intellectual Property

- [View Continuation-in-Part Patent in PDF format.](#)

Tech Fields

- [Analytical Instrumentation, Methods & Materials : Sensors](#)

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