National Institute of Standards and Technology
U.S. Department of Commerce

COMMERCIALIZATION OPPORTUNITY

Detection of J-coupling using Atomic Magnetometer

Patent Number: 9,140,657

Ref. 12-018

NEW ENABLING TECHNOLOGY

Nuclear magnetic resonance (NMR) is a powerful tool for determination of molecular structure and properties. Our invention provides for the direct detection of hetero- and homonuclear scalar coupling in a zero-field environment or a low field environment using an optical atomic magnetometer. It provides NMR without the use of any magnets by using parahydrogen induced polarization and a high sensitivity atomic magnetometer with a microfabricated vapor cell.

BETTER FASTER EFFICIENT TECHNOLOGY

The use of atomic magnetometers greatly improved sensitivity compared to inductive detection at low or zero fields because they sense magnetic field directly, rather than the time derivative of flux through a pickup coil. Furthermore, in contrast to superconducting quantum interference devices (SQUIDs), atomic magnetometers do not require cryogenics. Operation at zero field eliminates the chemical shift but retains substantial analytical information in simplified spectra by both heteronuclear and homonuclear scalar couplings.

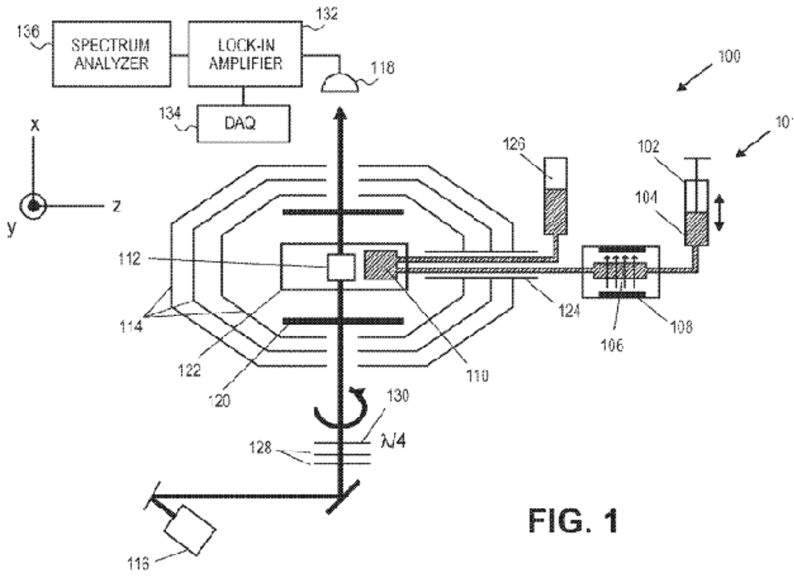

FIG. 1

System for detecting J-coupling.

PROVIDES FOR THE DIRECT DETECTION OF HETERO- AND HOMONUCLEAR SCALAR COUPLING IN A ZERO-FIELD ENVIRONMENT OR A LOW FIELD ENVIRONMENT USING AN OPTICAL ATOMIC MAGNETOMETER

- Does not require superconducting magnets or cryogenics to enable high resolution two-dimensional spectroscopy
- Variety of applications
- Direct detection of hetero- and homonuclear scalar coupling in a zero-field environment or a low field environment using an optical atomic magnetometer
- Operation at zero field eliminates the chemical shift but retains substantial analytical information in simplified spectra by both heteronuclear and homonuclear scalar couplings

CONTACT

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DON'T MISS OUT – PARTNER WITH NIST TODAY!

- **It can be used widely in pure research environments**
- **Industry**
- **Pharmaceutical drug discovery**
- **Chemical production**
- **And security monitoring applications.**

THE SOLUTION FOR A HOST OF ISSUES THAT PLAGUE MULTIPLE INDUSTRIES

Conventional NMR spectrometers are large and utilize superconducting magnets operating at liquid helium temperatures. This precludes their use in many situations where NMR would be benefcial. Benchtop NMR spectrometers are currently available operating in the 60 MHz range. However, they often lack the desired sensitivity. Our device eliminates these issues.

Our invention provides a new modality for high prevision 'J spectroscopy' using small samples on microchip devices for multiplexed screening, assaying and sample identifcation in chemistry and biomedicine.

MARKET

It does not require superconducting magnets or cryogenics to enable high resolution two-dimensional spectroscopy. The technology utilizes an atomic magnetometer instead of RF coils to directly sense a polarized sample's magnetic field and provides the desired sensitivity with small sample assays.

PARTNERSHIPS

Cooperative Research and Development Agreements (CRADAs), Patent License Agreements (PLAs) Abound

Opportunity for multiple collaborative development relationships with research and development. There is an opportunity for collaboration with fabrication facilities!

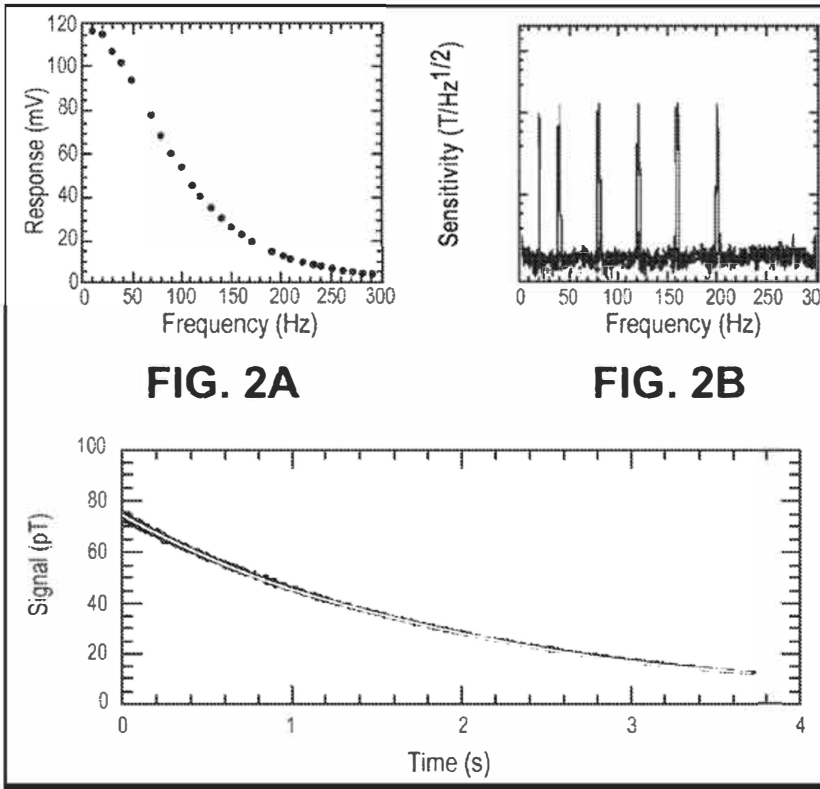

FIG. 2A FIG. 2B

Graphs that show the response of an atomic magnetometer to test fields of varying frequency and the noise floor of the magnetometer, respectively.

MULTIPLE APPLICATIONS ABOUND!

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