LICENSING OPPORTUNITY: DETECTION OF J-COUPLING USING ATOMIC MAGNETOMETER

DESCRIPTION

Problem

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 beneficial. 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.

Invention

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.

BENEFITS

Commercial Application

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.

It can be used widely in pure research environments:

- Industry
- Pharmaceutical drug discovery
- Chemical production
- Security monitoring applications

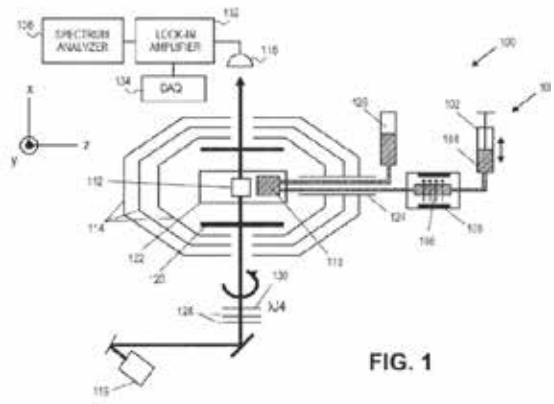

FIG. 1

System for detecting J-coupling.

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Competitive Advantage

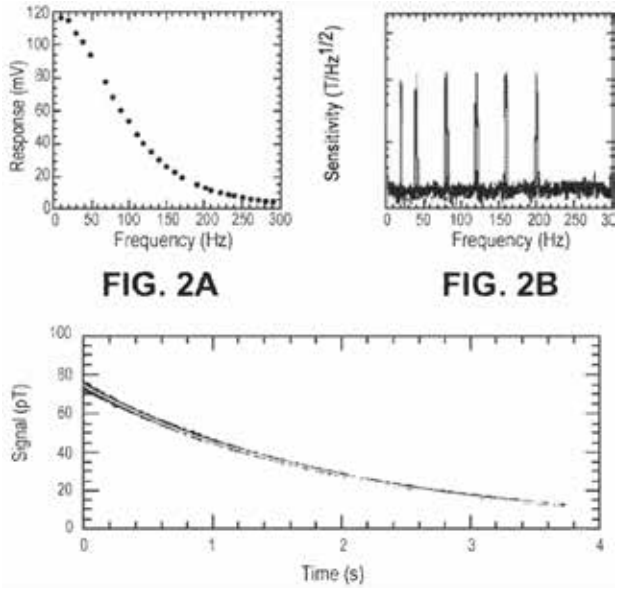
The use of atomic magnetometers greatly improved sensitivity compared to inductive detection at low or zero fields because they sense magnetic field directly, rather than the time derivative of flux through a pickup coil.

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.

- Does not require superconducting magnets or cryogenics to enable high resolution two-dimensional spectroscopy
- 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
- Variety of applications

Partnerships

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



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

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