modulation envelope **132** at the nuclear precession frequencies ω_a (ω_{a1}, ω_{a2}, and ω_{a3}). For example, the transmitted light **130** comprises the superimposed AC carrier magnetic field that comprises the nuclear precession frequencies ω_a as sidebands. The silicon photodetector **134** receives the transmitted light **130** and converts the transmitted light **130** into electrical signals.

The silicon photodetector **134** in one example processes the electrical signals to obtain angular rate information for the apparatus **100**. For example, the silicon photodetector **134** employs one or more of equations (5)-(10) to determine the angular rate information where ω_a (e.g., ω_{a1}, ω_{a2}, ω_{a3}) is the measured precession frequency. The computer-readable signal bearing medium **136** of the silicon photodetector **134** in one example comprises software, firmware, and/or other executable code for processing the electrical signals.

The apparatus **100** in one example comprises a plurality of components such as one or more of electronic components, hardware components, and computer software components. A number of such components can be combined or divided in the apparatus **100**. One or more components of the apparatus **100** may employ and/or comprise a set and/or series of computer instructions written in or implemented with any of a number of programming languages, as will be appreciated by those skilled in the art.

The apparatus **100** in one example employs one or more computer-readable signal-bearing media. The computer-readable signal-bearing media store software, firmware and/or assembly language for performing one or more portions of one or more implementations of the invention. Examples of a computer-readable signal-bearing medium for the apparatus **100** comprise the recordable data storage medium **136** of the silicon photodetector **134**. The computer-readable signal-bearing medium for the apparatus **100** in one example comprise one or more of a magnetic, electrical, optical, biological, and atomic data storage medium. For example, the computer-readable signal-bearing medium comprise floppy disks, magnetic tapes, CD-ROMs, DVD-ROMs, hard disk drives, and electronic memory. In another example, the computer-readable signal-bearing medium comprises a modulated carrier signal transmitted over a network comprising or coupled with the apparatus **100**, for instance, one or more of a telephone network, a local area network ("LAN"), a wide area network ("WAN"), the Internet, and a wireless network.

The steps or operations described herein are just exemplary. There may be many variations to these steps or operations without departing from the spirit of the invention. For instance, the steps may be performed in a differing order, or steps may be added, deleted, or modified.

Although exemplary implementations of the invention have been depicted and described in detail herein, it will be apparent to those skilled in the relevant art that various modifications, additions, substitutions, and the like can be made without departing from the spirit of the invention and these are therefore considered to be within the scope of the invention as defined in the following claims.

What is claimed is:

1. A method, comprising the steps of:

providing a nuclear magnetic resonance cell with first, second, and third nuclear moment gases and at least one optically pumpable substance;

obtaining first, second, and third measured precession frequencies that correspond to the first, second, and third nuclear moment gases, wherein the first, second, and third measured precession frequencies are altered from corresponding first, second, and third Larmor precession frequencies by a rotational rate, an applied magnetic field, and corresponding first, second, and third local magnetic fields; and

determining a base magnetic field as a function based on the at least one optically pumpable substance;

approximating the first, second, and third local magnetic fields as the base magnetic field multiplied by corresponding first, second, and third proportionality factors;

determining the rotational rate with compensation for the first, second, and third local magnetic fields through employment of:

the first, second, and third measured precessing frequencies;

the base magnetic field;

the first, second, and third proportionality factors; and

the applied magnetic field.

2. The method of claim **1**, wherein the step of determining the base magnetic field as the function based on the at least one optically pumpable substance comprises the step of:

determining the base magnetic field as a function of density of the at least one optically pumpable substance and spin polarization of the at least one optically pumpable substance.

3. The method of claim **2**, wherein the step of approximating the first, second, and third local magnetic fields as the base magnetic field multiplied by the first, second, and third proportionality factors comprises the steps of:

modeling the first measured precession frequency as:

$$\omega_1=\gamma_1 H+b_1 c-\Omega$$

modeling the second measured precession frequency as:

$$\omega_2=\gamma_2 H+b_2 c-\Omega$$

modeling the third measured precession frequency as:

$$\omega_3=\gamma_3 H+b_3 c-\Omega$$

where ω_n is the measured precession frequency for the three nuclear moment gases, γ_n is a gyromagnetic ratio for nuclear spin for the three nuclear moment gases, H is the applied magnetic field, b_n is the proportionality factor for the three nuclear moment gases, c is the base magnetic field, and Ω is the rotational rate information.

4. The method of claim **3**, further comprising the steps of:

determining the gyromagnetic ratios for nuclear spin for the three nuclear moment gases γ_n and the proportionality factor b through calibration.

5. The method of claim **4**, wherein the step of determining the gyromagnetic ratios for nuclear spin for the three nuclear moment gases γ_n and the proportionality factors b_n through calibration comprises the step of:

adjusting the applied magnetic field to determine the gyromagnetic ratios for nuclear spin for the three nuclear moment gases γ_n.

6. The method of claim **4**, wherein the step of determining the gyromagnetic ratios for nuclear spin for the three nuclear moment gases γ_n and the proportionality factor b through calibration comprises the step of:

adjusting a temperature within the nuclear magnetic resonance cell to determine the proportionality factors b_n.

7. The method of claim **4**, wherein the step of determining the gyromagnetic ratios for nuclear spin for the three nuclear moment gases γ_n and the proportionality factor b through calibration comprises the step of:

adjusting a light level within the nuclear magnetic resonance cell to determine the proportionality factors b_n.