

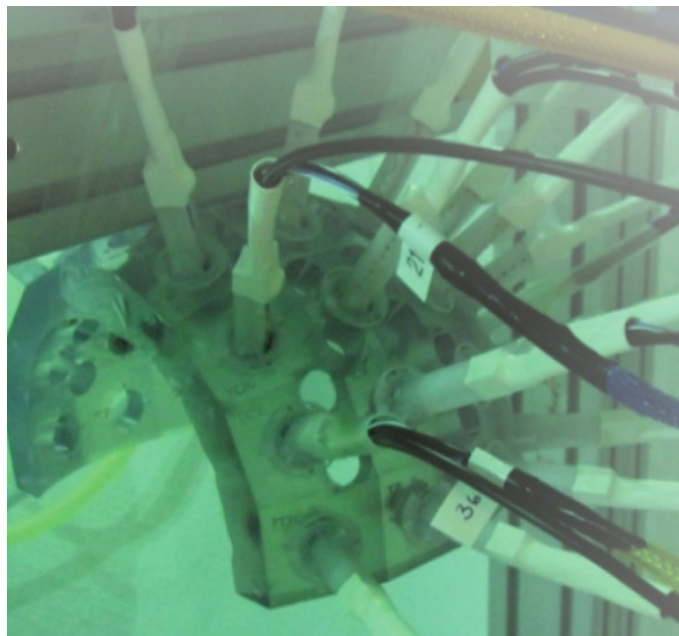
# LICENSING OPPORTUNITY: ATOMIC MAGNETOMETER AND METHOD OF SENSING MAGNETIC FIELDS

## DESCRIPTION

### Invention

NIST has made long-awaited advances in the creation of magnetometers and in detecting magnetic fields.

The chip-size NIST atomic magnetometer has at least one sensor head void of extraneous metallic components, electrical contacts, or electrically conducting pathways. This novel sensor contains an active material vapor, such as an alkali vapor, that alters at least one measurement parameter of light passing through, when in a magnetic field. The sensor has an absorptive material configured to absorb laser light and thereby activate or heat the active material vapor.



Chip-scale atomic magnetometers arranged in an array around a human head to detect brain magnetic fields.

## BENEFITS

### Potential Commercial Applications

- Measurement of magnetic fields from living systems
- Detection of magnetic anomalies, such as submarines and ships, for defense purposes
- Measurement of geomagnetic fields, which are useful for oil and mineral exploration
- Geophysical mapping
- Measurement of geomagnetic fields for positioning and navigation
- Underground deposit detection
- Navigation
- Nuclear magnetic resonance
- Space science
- CubeSats
- Physiological mapping (e.g., human heart and brain)

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**NIST** TECHNOLOGY PARTNERSHIPS  
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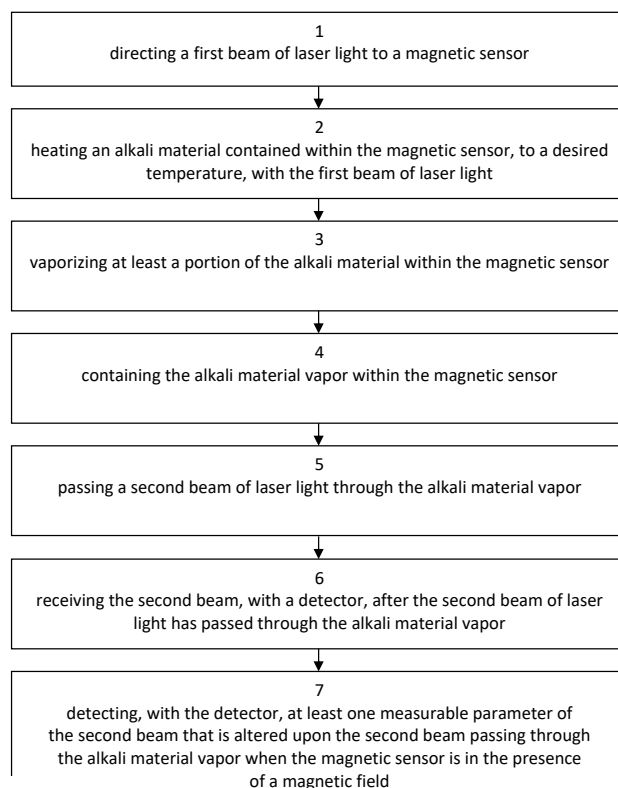
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## Competitive Advantage

- Elimination of electrodes in direct contact with the patient's body
- Richer content of information
- Non-interference of the sample being monitored, unlike the large-scale, expensive, and difficult-to-operate current atomic magnetometers.
- DC sensitivity
- Detection of the relaxation and transport of magnetic nanoparticles for imaging and flow measurement
- Detection of nuclear magnetization in very low magnetic fields
- Multichannel system can image magnetic sources inside the head
- Detection of magnetic fields produced by the human heart and brain
- Smaller
- Less expensive
- Less power consumption

The NIST Atomic Magnetometer allows for considerable reduction in the size, power consumption, and thus manufacturing cost.

Mobile magnetoencephalography is now a possibility.



Flow diagram showing a method of detecting a magnetic field with an atomic magnetometer.

## Partnerships

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

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