# LICENSING OPPORTUNITY



# **Heisenberg Scaler**

Patent 11,562,049 Reference No. 19-006US1 Technology Partnership Office licensing@nist.gov

# **Description**

### **Problem**

Entanglement is a valuable resource for quantum technology. In metrology, entangled probes are capable of more accurate measurements than unentangled probes. In addition to using entangled probes to measure parameters of interest, using entanglement to estimate many parameters at once, or a function of those parameters, has recently been an area of interest due to its potential applications in tasks such as nanoscale nuclear magnetic resonance imaging. Our protocol and Heisenberg scaler offer reduced noise over performing the same procedure classically.

#### Invention

We have created a protocol and Heisenberg scaler that optimally uses quantum entanglement in a network of quantum sensors to optimally measure any smooth function of the fields at the sensors. The method applies even when the fields at the sensors are for different purposes such as one sensor measuring the electric field and another sensor measuring temperature. The method also applies to arrays of interferometers, as well as to measuring functions of parameters some of which are measured by sensors, while others are measured by interferometers.

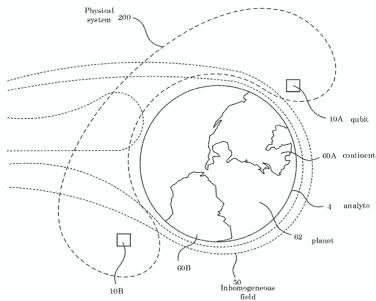
## **Benefits**

### **Commercial Application**

There are a huge number of potential applications from geodesy and geophysics (like earthquake or volcano eruption prediction) to biology and medicine (the sensors can all be separated by small distances and measure temperature, magnetic fields, electric fields, or a host of other things inside a human body).

### **Competitive Advantage**

Superior in measuring properties of inhomogeneous fields or, more generally, functions that depend on more than one measurable quantity.



A system for determining a modal amplitude of an inhomogeneous field of an analyte