PARAGRAF
LEADING THE WAY IN GRAPHENE ELECTRONICS

Graphene Hall sensors for cryogenic applications

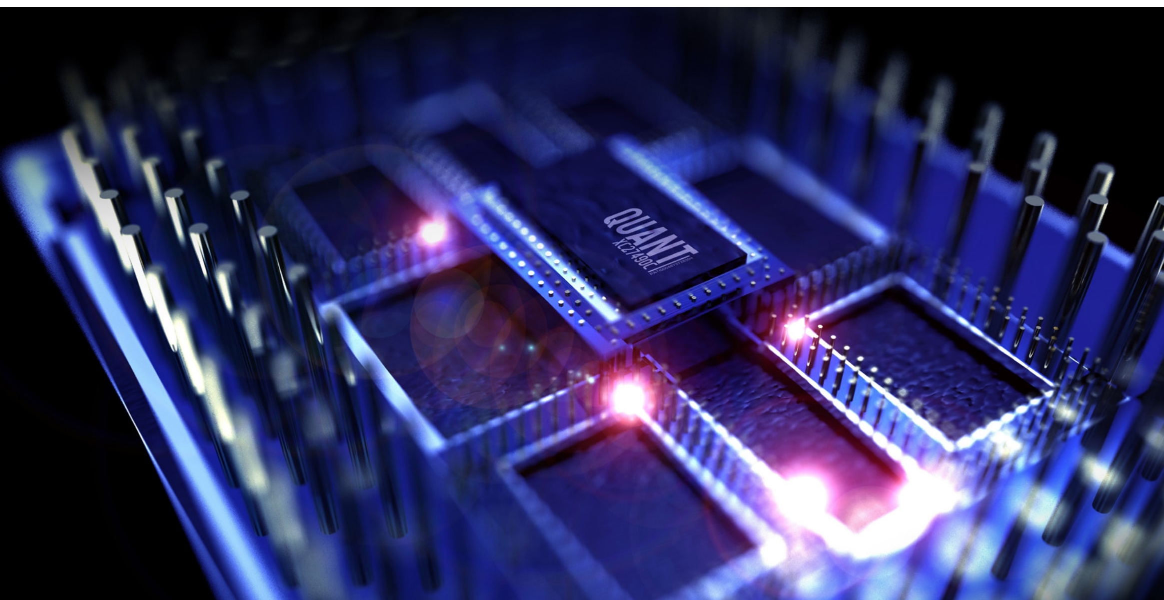
Paragraf is enhancing its customers' ability to conduct magnetic field measurement in low-temperature and high-field environments.

Until now, conventional Hall sensors have been limited by material capabilities and a phenomenon known as the Quantum Hall Effect (QHE). With our unique graphene deposition process, Paragraf is averting these limitations by producing a cryogenic Graphene Hall Sensor (GHS) which has achieved operation down to millikelvin temperatures and fields measurements of over 30 Tesla.

Graphene and Robustness

Conventional Hall effect sensors can experience thermal expansion and contraction of their components when moving between varying temperatures, leading to the degradation of materials and failure of the sensing function.

Owing to its two-dimensional structure, graphene is an exceptionally flexible and robust material, capable of withstanding extreme temperatures and temperature shocks. Paragraf's cryogenic GHS makes use of that flexibility, while enhancing the overall material strength of the sensor, by handling the entire construction process in our own facility. Using our patented technique, we incorporate the graphene layer into the sensor in a structurally-sound and impurity-free manner. This produces a sensor with a superior, highly durable construction.



Ease of Use

The ability of the cryogenic GHS to operate at low temperatures means that it does not require the use of additional inserts to protect it. This allows for enhanced flexibility in locating a device within the sample loader. The small size of the GHS and its low power dissipation, means that the device can be placed closer to the field.

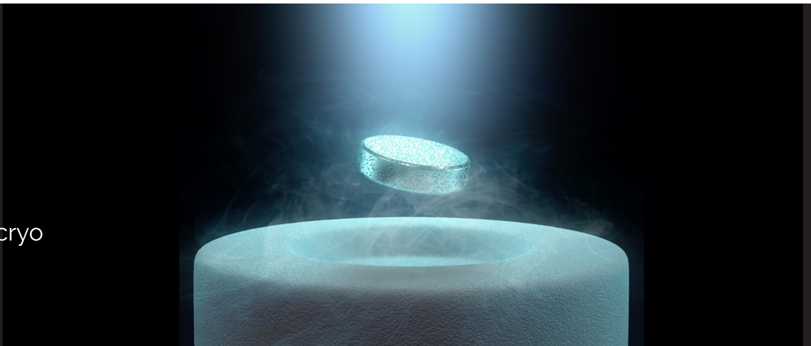
Applications

- Magnetic field monitoring for quantum computing
- Electromagnet R&D and manufacture
  - Mapping of superconducting magnets – direct in cold bore
- Accurate magnet calibration at cryogenic temperatures
  - Monitoring of magnet drift
  - Flux pinning identification
- Magnetic field monitoring during cryogenic experiments
  - Built into superconducting magnet coils (active or persistent mode)
  - Built onto sample stages designed for cryogenic use
- Magnetic shielding attenuation factor determination – use the same sensor for field measurement on the inside and outside of the shield
  - To characterise shielding of superconducting magnets

Benefits

- Linearity up to 30 T
- Operable at mK temperatures
- Very low power dissipation (a few nW)
- Small form factor (3 x 3 x 1.2 mm ceramic QFN package)
- Lack of planar Hall effect, owing to 2D construction
- Very high resolution

Paragraf cryogenic GHS mounted on an Oxford Instrument's Proteox dilution refrigerator



Contact us:

+44 1223 739782
sales@paragraf.com
www.paragraf.com/cryo