Universität Basel

Research Project

DIADEMS

Third-party funded project

Project title DIADEMS
Principal Investigator(s) Maletinsky, Patrick ;
Organisation / Research unit
Departement Physik / Georg H. Endress-Stiftungsprofessur für Experimentalphysik (Maletinsky)
Department
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The DIADEMS project aims at exploiting the unique physical properties of NV colour centres in ultrapure single-crystal CVD-grown diamond to develop innovative devices with unprecedented performances for ICT applications. The atom-like structure of the NV^- exhibits spin dependentoptical transitions. Thus optics-based magnetometry is possible. The objectives are to develop: wide field magnetic imagers with 1 nT/$Hz^{1/2}$ sensivities, scanning probe magnetometers with sensitivity 10 nT/$Hz^{1/2}$ and spatial resolution 10 nm, sensor heads with resolution 1 pT/$Hz^{1/2}$. To reach such performances, we will use new theoretical protocols for sensing, develop ultrahigh purity diamond material with controlled single nitrogen implantation with a precision <5 nm, process scanning probe tips with diameter in the 20 nm range and transfer them to AFM cantilever, improve the emission properties of NV- coupling them with photonic cavities and photonic waveguides.

The consortium gathers prominent groups in France, Germany, Switzerland, Belgium, UK, Hungary and Israel that have pioneered this field. All aspects of the chain from starting material, devices development and applications are present in the consortium coordinated by THALES. The Quantum Sensing Group (Prof. P. Maletinsky) is leading the nanophotonics section of this European collaboration and plays a key role in the consortium as a main centre for state of the art diamond nanofabrication.

DIADEMS outputs will demonstrate new ICT functionalities that will boost applications with high impact on society: calibration and optimization of write/read magnetic heads for future high capacity (3 Tbit/in^2) storage disk required for intense computing, imaging of electron-spin in graphene and carbon nanotubes for next generation of electronic components based on spintronics, non-invasive investigation of living neuronal networks to understand brain function, demonstration of magnetic resonance imaging of single spins allowing single protein imaging for medical research.

DIADEMS aims at integrating the efforts of the European Community on NV centres to push further the limits of this promising technology and to keep Europe's prominent position.

Keywords Quantum sensing, spin, diamond, nanotechnology
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Add publication

Add documents

Specify cooperation partners