# Magnetic imaging of spin waves and supercurrents using spins in diamond

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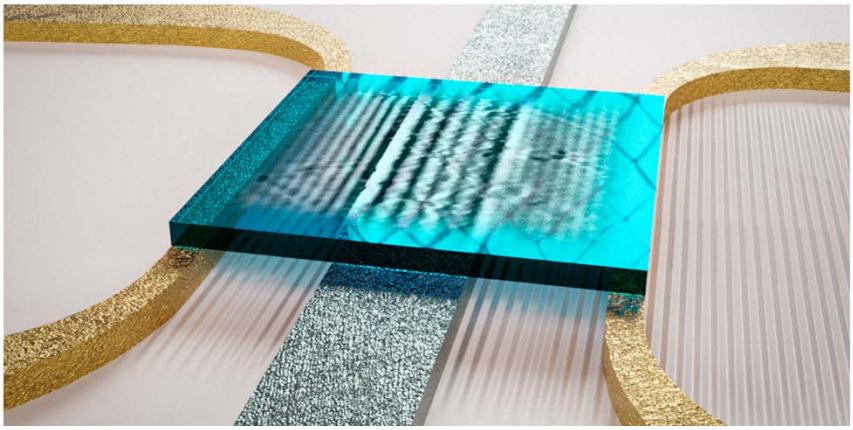
Spin waves are collective excitations of the spins in magnetic materials. They play an important role in the thermodynamics of magnetic materials and are promising as signal carriers in information devices. In this talk, I will introduce magnetic imaging based on electron spins in diamond and boron nitride(*1*, *2*) as a microscopy technique for studying spins and electric currents in materials on the micro-to-nanoscale. I will show how this technique enables imaging spin waves in thin magnetic films and describe experiments on the interaction of spin waves with currents in normal[3] and superconducting metals(*3*). Our results indicate that superconductors provide opportunities for realizing tunable spin-wave optical devices that could be used for on-chip microwave-control in classical or quantum circuits.



***Imaging spin waves underneath a superconducting control electrode using spins in diamond. Credit: M. Borst***

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2. I. Bertelli *et al.*, Magnetic resonance imaging of spin-wave transport and interference in a magnetic insulator. *Sci Adv*. **6**, eabd3556 (2020).
3. M. Borst *et al.*, Observation and control of hybrid spin-wave–Meissner-current transport modes. *Science (1979)*. **382**, 430–434 (2023).