

*Séminaire AXE 1 - Sciences et Matériaux Quantiques*



**Vendredi 31 Janvier 2025 | 14:00 | Auditorium de l'IPCMS  
Laetitia Farinacci**

*Institute for Functional Matter and Quantum Technologies - University of Stuttgart*  
[laetitia.farinacci@fmq.uni-stuttgart.de](mailto:laetitia.farinacci@fmq.uni-stuttgart.de)

***Sensing and harnessing the quantum nature of spins at the atomic scale***

The next generation of technological innovations will rely on our ability to exploit the quantum properties of their components. In order to pursue this goal, a fundamental understanding and control of condensed matter at the atomic scale is very desirable.

During my talk I will present a recent technological development in the field of scanning tunneling microscopy: its combination with electron spin resonance allows to probe the properties of single atomic spins with neV resolution and a full control over their surroundings. In combination with pulsed measurements one can furthermore achieve coherent control, paving the way for a comprehensive control of spins at the atomic scale. Yet, so far, all species studied with ESR-STM have low coherence times. One of the main challenge of the coming years will be to identify new platforms that display longer coherence times. A promising system are magnetic bound states in superconductors, which arise when a magnetic impurity is placed in the proximity of a superconductor and are protected by the superconducting gap. These states have been enthusiastically studied over the last decade as they could serve as building blocks for topological superconductivity. I will present their fundamental properties and outline the next challenges to overcome in order to achieve coherent control over their configuration.

These studies set the foundation for exciting future research in the fields of quantum sensing and quantum computing at the atomic scale.