

Scientific Area	Developing Quantum Hardware
Topic title	Cavity-enhanced spin-photon interface for SnV centers in diamond
Main host institution	Karlsruhe Institute of Technology (KIT) www.kit.edu
Supervisor/institution	Prof. Dr. David Hunger https://www.phi.kit.edu/hunger.php
Co-Supervisor/institution	Shannon Whitlock https://www.usias.fr/en/fellows/2017-fellows/shannon-whitlock/
Mentor¹/institution	Wolfgang Wernsdorfer https://www.phi.kit.edu/wernsdorfer.php
Secondment institution	R. Warburton, Basel https://physik.unibas.ch/en/persons/richard-warburton/
Topic description	
<p>Color centers in diamond are a promising material platform for the development of quantum technologies due to the exceptional coherence of their optical transitions and spin states. In the group of Prof. Hunger and in collaboration with Prof. Wernsdorfer, we are investigating tin vacancy (SnV) centers in diamond to realize long-lived optically addressable quantum memories [Karpatzakis et al., Phys Rev X 14, 031036 (2024)]. We incorporate color centers in optical microcavities to enhance light-matter interactions [Pallmann et al., Phys Rev X 14, 041055 (2024)].</p> <p>In this project, we want to gain control over a few-qubit nuclear spin quantum register coupled to an SnV center to enable quantum error correction. Further, we aim to couple individual SnV centers to a microcavity and combine it with spin control to generate efficient spin-photon entanglement. With this, we want to transmit spin-photon entanglement across a recently established 20 km fiber quantum link at KIT.</p>	
Recommended applicant's profile	
<p>The candidate should hold a master degree in Physics with basic knowledge in the fields of optics, atomic physics, and quantum physics. Experimental skills in the fields of quantum optics, spin physics, photonics, or cryogenics is highly appreciated.</p>	

¹ Mentor: The primary role of the mentors will be to identify and facilitate specific training objectives, advise on any problems faced by the ESR, including career matters with an external perspective and provide mediation in the case of disputes.