SPQV

Spin-Photon Qudits with Vanadium in Silicon Carbide

Programm / Ausschreibung	Quantum Austria 3. Ausschreibung (2023/2024)	**Status**	laufend
Projektstart	25.04.2024	**Projektende**	31.01.2026
Zeitraum	2024 - 2026	**Projektlaufzeit**	22 Monate
Keywords	Quantum computing; Spin; photon; qudit; silicon carbide; microcavitiy		

Projektbeschreibung

Vanadium in Siliziumcarbid wird als Qudit entwickelt und in einen photonischen Mikroresonator aus Silizium integriert werden, um Spin-Photon Verschränkung zu erzielen. Dies wird die Grundlage für einen Halbleiter-basierten Quantenrechner mit hervorragender Modularität und Skalierbarkeit bilden.

Abstract

We will develop vanadium in silicon carbide to leverage its multi-level qudit spin structure for fault-tolerant qubit encoding. By enhancing its interaction with light using a silicon microcavity, we will demonstrate spin-photon entanglement. These achievements will lay the groundwork for a highly modular and scalable quantum computing architecture based on semiconductors.

Endberichtkurzfassung

SPQV has provided a significant boost on the path to spin-photon quantum information and communication systems. The project has supported the development of novel experiments on silicon carbide spin centres and their integration with photonic devices. In particular, SPQV has allowed to gain control over the multidimensional spin system of vanadium in silicon carbide, and the creation of micro-photonic systems based on these spin centres. Furthermore, SPQV has enabled enhanced collaboration between quantum researchers and leading industrial semiconductor manufacturers for the development of quantum devices. Finally, SPQV made possible the in-depth analysis of conceptual aspects of spin-photon interfaces and their application to quantum technology.

Projektpartner

- Österreichische Akademie der Wissenschaften