Hybrid-Kolloquium

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Kolloquium

Decoherence-free singlet-only spin qubits

physikalisches

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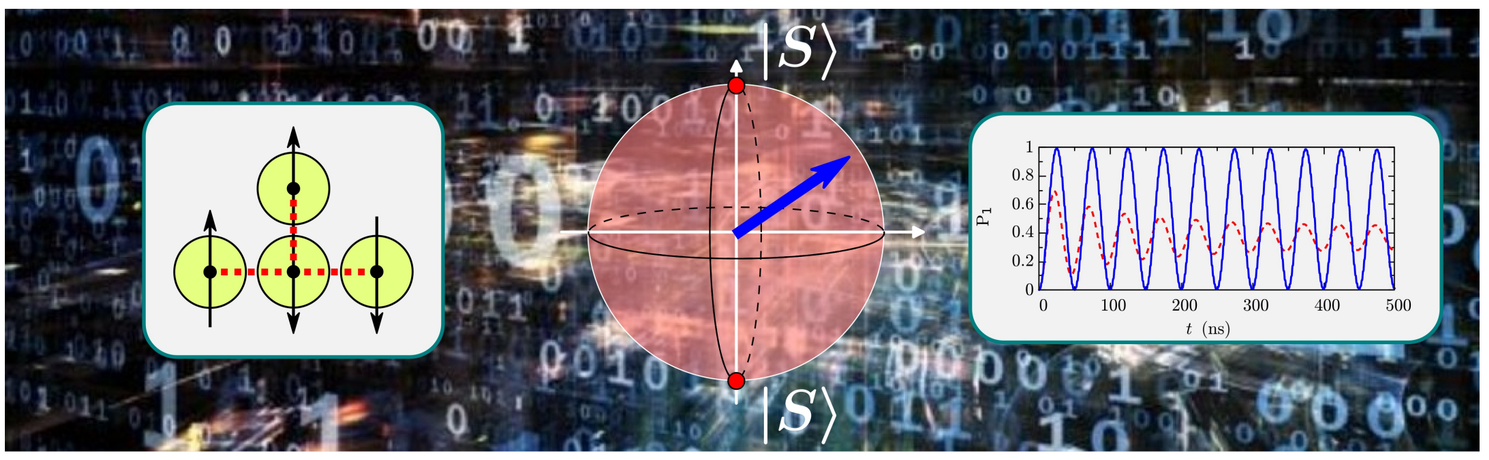
go.ur.de/Koll

One of the most exciting proposed quantum technologies is quantum computation, where information is coded in quantum bits (qubits), instead of classical bits. A quantum computer could perform certain tasks exponentially faster than a regular computer, such as database searching and prime factorization.

The quest for the optimal physical qubit implementation (stable, controllable, and scalable) is at full speed, and by now the research has been narrowed down to a handful of promising approaches. Semiconductor spin qubits are particularly attractive, due to their fast operation time, small size, and scalable nature.

In this talk, I will start by giving a brief overview of the development of the quantum-dot-based spin qubit over the past two decades. I will highlight the main remaining challenges for creating reliable and scalable spin qubits, one of which is the magnetic noise caused by fluctuating nuclear spins, present in many popular host materials.

I will then present an intrinsic solution to this problem: the four-electron singlet-only qubit, which lives in a so-called decoherence-free subspace. I will explain how an adapted version of such a qubit can conveniently be implemented in existing qubit designs, possibly yielding a significant improvement in the coherence time for certain types of spin qubits.



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