UNIMORE
UNIVERSITÀ DEGLI STUDI DI MODENA E REGGIO EMILIA

Dipartimento di Scienze Fisiche, Informatiche e Matematiche

CNRNANO MODENA S3

FIM-S3 SEMINAR

Hole spin qubits in Si and Ge quantum dots: Ultrafast gates and noise resilient qubits

Wednesday July 14th, 2021 – 16.00

Online streaming using Google Meet
Link: https://meet.google.com/urn-vauy-ecv

Speaker

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Abstract

Hole spin qubits in Si and Ge quantum dots are frontrunner platforms for scalable quantum computers [1,2]. In these systems, the spin-orbit interactions permit efficient and ultrafast all-electric qubit control [3,4], but at the same time enhance the susceptibility of the qubit to charge noise. We show that these interactions can be fully tuned by the design of the quantum dot and by external electric fields [5], resulting in sweet spots where charge noise is removed [6]. Remarkably, at these sweet spots also the noise caused by the hyperfine interactions with nuclear spins -another leading source of decoherence in spin qubits- can be suppressed [7], greatly enhancing the coherence of these qubits.

[1] R. Maurand et al., A CMOS silicon spin qubit. Nat. Commun. 7, 13575 (2016).
[2] G. Scappucci et al., The germanium quantum information route. Nat. Rev. Mater. (2020).
[3] F. N. M. Froning et al., Ultrafast hole spin qubit with gate-tunable spin–orbit switch functionality. Nat. Nanotechnol. 16, 308–312 (2021).
[4] Camenzind et al., A spin qubit in a fin field-effect transistor. arXiv:2103.07369 (2021).
[5] S. Bosco, M. Benito, C. Adelsberger, D. Loss, Squeezed hole spin qubits in Ge quantum dots with ultrafast gates at low power. arXiv:2103.16724 (2021).
[6] S. Bosco and D. Loss, Hole spin qubits in Si finFETs with fully tunable spin-orbit coupling and sweet spots for charge noise. PRX Quantum 2, 010348 (2021).
[7] S. Bosco and D. Loss, Fully tunable hyperfine interactions of hole spin qubits in Si and Ge quantum dots. arXiv:2106.13744 (2021).

In collaboration with

MAX DRIVING THE EXASCALE TRANSITION

SUPER

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