The germanium quantum information route

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(Host: Prof. Pasquale Scarlino)

Date and time: **Friday April 30th, at 15:15**

Link: <https://epfl.zoom.us/j/89778378177>

Abstract: The semiconductor industry knows how to make and integrate billions of excellent transistors. What are the materials requirement that will enable the integration of excellent qubits for the quantum information age of tomorrow? Today I will make a case for the germanium quantum information route [1]. Germanium is emerging as a versatile material to realize devices capable of encoding, processing and transmitting quantum information. I will examine the materials science progress underpinning germanium-based planar heterostructures [2], review our most significant experimental results demonstrating key building blocks for quantum technology [3,4], and  identify the most promising avenues toward scalable quantum information processing in germanium-based systems.

[1] G. Scappucci et al, *The germanium quantum information route*,
**Nat Rev Mater** (2020). <https://doi.org/10.1038/s41578-020-00262-z>
[2] A. Sammak et al. *Low disordered, stable, and shallow germanium quantum wells: a playground for spin and hybrid quantum technology*, **Advanced Functional Materials**1807613 (2019)
[3] N. Hendrickx et al, *Fast two-qubit logic with holes in germanium*, **Nature** 577, 487 (2020)
[4] N. Hendrickx et al, *A four qubit germanium quantum processor*, **Nature** 591, 580 (2021)

Long-time advocate of the Si/Ge material system, Giordano Scappucci leads the development of materials for spin-based quantum computing at QuTech, TU Delft. The silicon and germanium-based quantum materials developed by Giordano’s team were pivotal to landmark experiments published recently in Nature and Science and are used by many researchers overseas for the development of quantum technologies. Giordano published about 80 journal articles and has given over 50 invited talks at  international conferences, universities, research institutes and industry.

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