

300 mm Process Development and Technology De-Risking for Silicon Quantum Dot Spin Qubit

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IMEC's 300 mm process line combines state-of-the-art industrial manufacturing tools with process flexibility, making it a unique platform for addressing the challenges of large-scale spin-qubit technologies. Our work has focused on optimizing both process integration and device design to realize low-disorder, low-noise quantum dots in MOS and Si/SiGe platforms, while also identifying the limitations and strengths of different lithography technologies necessary for the fabrication of scalable quantum computing architectures.

In this presentation, I will first outline IMEC's strategy and process flows for device optimization and defectivity reduction. I will then present an overview of the recent results achieved on our devices. Finally, recognizing that demonstrating a few qubits is not sufficient for large-scale quantum computing, I will discuss scalable architecture based on a full back-end-of-line integration approach. Enabled by advanced EUV lithography, this architecture provide a pathway toward addressing scaling challenges of silicon quantum dot spin qubits systems.