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QUTES
SEMINAR ON QUANTUM TECHNOLOGY

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Towards Large-Scale Integration of Superconducting Qubit Devices

Abstract
The field of superconducting qubit technology has seen a rapid development in the last two decadeds. Advances in fabrication, control and measurements of superconducting quantum devices have recently enabled integration of almost hunderd qubits on a single chip [1]. However, the path forward to a large-scale integration of thousands of qubits on a chip is far from clear. In this talk, I will present a platform capable of fabricating, characterizing and controlling a large-scale quantum computer based on superconducting qubits. At the heart of this platform is a foundry-compatible qubit fabrication process on 300 mm silicon wafers including Josephson junction fabrication [2,3]. The fabrication depends heavily on understanding and minimizing microwave losses in a single photon power regime [4]. We have developed a method based on cryo-CMOS electronics at millikelvin temperatures that can enable large-scale characterization of quantum devices [5]. This method supported by the quantum circuit simulation package has a perspective to carefully study and enable control of larger quantum systems [6]. Our work marks the beginning of a systematic and large-scale study of superconducting device fabrication and characterization with the aim to open the path towards a large-scale quantum system integration.

[1] Arute, F. et al. Nature 574, 505-510 (2019).
[2] Satoh, T. et al. IEEE Transactions on Applied Superconductivity 25, 1–5 (2015).
[3] Wan, D. et. al. accepted in JJAP (2021).
[4] Verjauw, J. et al. arXiv 2012.10761 (2020).
[5] Potocnik, A. et al. arXiv 2011.11514 (2020).
[6] Acharya, R. et al. Proceedings of the Design, Automation & Test in Europe (DATE) (2021)

All Ages Event

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April 2, 2021, 16:00 – 17:00

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