Fast measurement and initialization of superconducting qubits

Joni Ikonen[1], Jan Goetz[1], Matti Silveri[3], Shumpei Masuda[1], Vasilii Sevriuk[1], Jesper Ilves[1], Aarne Keränen[1], Andras M. Gunyho[1], Matti Partanen[1], Kuan Y. Tan[1], Fabian Hassler[4], Russell E. Lake[1], Dibyendu Hazra[1], Leif Grönberg[2], Visa Vesterinen[2], Slawomir Simbierowicz[2], Juha Hassel[2], and Mikko Möttönen[1]

[1]*QCD Labs, Aalto University, Aalto, Finland*
[2]*VTT Technical Research Centre of Finland, VTT, Finland*
[3]*Research Unit of Nano and Molecular Systems, University of Oulu, Oulu, Finland*
[4]*JARA Institute for Quantum Information, RWTH Aachen University, Aachen, Germany*

In this talk, I will cover two very recent results from the QCD Labs, namely, a method and implementation of fast qubit readout [1] and on-demand controllable dissipation and Lamb shift in a superconducting resonator [2]. The latter work is based on our recently developed quantum-circuit refrigerator which is has great potential in becoming a standard initialization tool in circuit quantum electrodynamics and especially in the superconducting quantum computer.

[1] J. Ikonen et al., Phys. Rev. Lett. 122, 080503 (2019).

[2] M. Silveri et al., Nat. Phys. https://doi.org/10.1038/s41567-019-0449-0 (2019).

[3] K. Y. Tan et al., Nat. Commun. 8, 15189 (2017).