Plenary Talk   PV VII   Wed 9:15   Audimax
Quantum simulation of dissipative collective effects on noisy quantum computers — ●Sabrina Maniscalco[1,2,4], Marco Cattaneo[1,4], Matteo Rossi[2,3], Guillermo Garcia Perez[1,2], and Roberta Zambrini[4] — [1]QTF Centre of Excellence, Department of Physics, University of Helsinki, P.O. Box 43, FI-00014 Helsinki, Finland — [2]Algorithmiq Ltd, Kanavakatu 3C 00160 Helsinki, Finland — [3]Instituto de Fisica Interdisciplinar y Sistemas Complejos (IFISC, UIB-CSIC), Campus Universitat de les Illes Balears E-07122, Palma de Mallorca, Spain — [4]QTF Centre of Excellence, Department of Applied Physics, School of Science, Aalto University, FI-00076 Aalto, Finland

I will present the first fully quantum simulation of dissipative collective effects on a near-term quantum computer. We employ a recently introduced algorithm based on a collision model to implement the superradiant and subradiant dynamics of two qubits on a near-term quantum device.

Our experimental outcomes successfully display the emergence of dissipative collective effects on a near-term device. Furthermore, full process tomography allows us to compare different figures of merit for the gate errors. We show that a common procedure broadly employed in the literature to estimate the experimental average gate fidelity, namely randomized benchmarking, may not always be reliable. In addition, rigorous computation of the gate errors shows that the thresholds for fault-tolerant computation are still orders of magnitude away in near-term devices.