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Announcement of Scientific Presentation

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Title: **“Evidence for a two-dimensional quantum glass state at high temperatures”**

Abstract:
The dynamics of interacting quantum particles in disordered landscapes is a central problem in non-equilibrium physics. Theoretical and numerical approaches are severely limited by exponential Hilbert space scaling and the absence of translational symmetry. Here, we leverage the high data rates of a continuous-time superconducting quantum processor to efficiently sample Hilbert space configurations for 2D array of artificial spins 1/2 with XY exchange and random fields along Z axis. Using a grid of up to 70 qubits, we measure the return probability R(t) across a broad range of disorder strengths and for energies close to the middle of the band (infinite-temperature limit). At long times, R(t) develops a heavy-tailed distribution, while its typical value follows a power-law scaling—both suggestive of non-ergodic glass-like dynamics. Furthermore, the probability distribution of z-configurations evolves from a Porter–Thomas form at low disorder to a power-law—spanning eight orders of magnitude—at higher disorder strengths. We cluster the wavefunctions on the basis of Hamming distance in Hilbert space, identifying three distinct regimes as a function of disorder strength. By directly probing Hilbert space dynamics, we provide a complementary perspective to the existing real-space picture of two-dimensional quantum systems, demonstrating the potential of current quantum processors to yield deeper insights into non-equilibrium physics [1]

[1] A. Lunkin,.....M.V. Feigel'man, L.B. Ioffe <Google Quantum AI and collaborators>,
Evidence for a two-dimensional quantum glass state at high temperatures.
arXiv:2601.01309

Host: Prof. Dr. Ferdinand Evers &
Prof. Dr. Christoph Strunk