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Institute colloquium

Correcting decoherence errors in quantum superconducting circuits

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Host: Johannes Fink

The accuracy of logical operations on quantum bits (qubits) must be improved for quantum computers to surpass classical ones in useful tasks. To that effect, quantum information must be robust to noise that affects the underlying physical system. Rather than suppressing noise, quantum error correction aims at preventing it from causing logical errors. This approach derives from the reasonable assumption that noise is local: it does not act in a coordinated way on different parts of the physical system. Therefore, if a logical qubit is encoded non-locally, it is possible, during a limited time, to detect and correct noise-induced evolution before it corrupts the encoded information. We will discuss how recent experiments [1, 2] based on superconducting cavities and transmon artificial atoms - employed here as ancillary non-linear elements - realize this error correction, and its prospect for reservoir engineering implementations that would realize the desirable next stage: autonomous quantum error correction.

[1] Grimm et al. , *Nature*, **584**, 205–209 (2020); [2] Campagne-Ibarcq et al., *Nature,* **584**, 368-372 (2020).

Monday, June 21, 2021 04:00pm - 05:00pm

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