Seminar/Talk

Quantum Rifling: Revisiting the Stern-Gerlach experiment with a twist

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Quantum mechanics postulates that a measurement forces the wavefunction of a qubit to collapse to one of its two eigenstates. The result of the measurement can then be recorded as a discrete outcome designating the particular eigenstate the qubit collapsed to. I will show that this well-accustomed picture of quantum measurement breaks down when the qubit is strongly driven during measurement. More specifically, when the evolution speed exceeds a threshold defined by the characteristic measurement time, the outcome does not contain any information about the initial state of the qubit, and thus the measurement does not generate any back-action. We call this phenomenon quantum rifling (in analogy with the way a bullet is made to spin before it leaves the barrel of a gun), as the fast spinning of the Bloch vector protects it from collapsing into either of its two eigenstates. We study this phenomenon with two superconducting qubits coupled to one and the same detector and demonstrate that quantum rifling allows us to measure either one of the qubits on demand while protecting the state of the other one from the measurement back-action.

Tuesday, May 28, 2019 02:00pm - 03:00pm
Mondi Seminar Room 2, Central Building

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