Solid State Institute
המכון למצב מוצק

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מכון טכנולוגי
לישראל

Seminar **סמינר**

An entangling gate between two logical qubits redundantly encoded in two cavities

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Abstract

Practical quantum information processing relies on the ability to protect qubits against errors. This is often achieved by encoding every qubit in multiple two-level systems ("physical qubits"), thus forming a redundantly encoded "logical qubit". However, implementing gates between such logical qubits requires a large number of operations between pairs of physical qubits.

In this talk, I will present a scheme for an entangling gate between two redundantly encoded logical qubits, and its recent experimental realization. The scheme relies on an alternative approach for realizing logical qubits, which uses the multilevel structure of a *single* cavity, instead of multiple two-level systems. A single ancillary transmon is used to induce nonlinear coupling between two cavities, thereby generating an effective interaction between the photonic states. The gate is controlled using parametric pumping on the transmon, resulting in an entangling rate between the cavities that is three orders of magnitude larger than the cavity decoherence rate and parasitic interactions. We characterize the gate by full quantum process tomography, and measure a reduction in fidelity per gate application as low as ~1%, on par with state-of-the-art gates between two-level physical qubits. These results demonstrate the potential of cavity-encoded logical qubits beyond the robust storage of quantum information, and open a route towards their use in larger quantum networks.

ההרצאה תתקיים ביום רביעי, 21.12.16 בשעה 12:30

בבניין פיסיקה, חדר 620

The lecture will take place on Wednesday, 21.12.16 at 12:30

at the Physics Building, Room 620

Host: Associate Professor Oren Cohen