Solid State Institute
המכון למצב מוצק

TECHNION
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הטכניון
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# SPECIAL SEMINAR

# סמינר מיוחד

## Entanglement of macroscopic objects

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**Abstract**

Generation and characterization of non-classical states has been moving forward thanks to a continued effort to control the environment (dissipation), increase the interaction (coupling) and measure carefully (measurement efficiency). While we discuss all three, this talk will focus on the latter. Specifically for microwave-based platforms, improving measurement efficiency has been an outstanding challenge for superconducting qubits and mechanics both for detection and feedback control.

Our system of choice is made of mechanical elements of ~10 micrometer size that interface a microwave resonator for detection and manipulation. We show strong correlations between the position of one drum and the position of another drum with a corresponding anti-correlation for the momenta. Proving entanglement requires measuring the variances of the correlated signals with a resolution and an accuracy that are well below the zero-point fluctuations of the drums. The correlated signal variance (inferred) is more than a factor of two smaller than the zero-point motion induced fluctuations of any classical state. Moreover, these correlations survive ~70% of microwave loss while retaining non-classicality.

The amount of entanglement measured encourages future research directions that include: entanglement distribution between separate dilution refrigerators, quantum illumination of objects, and quantum teleportation of mechanical states.

**ההרצאה תתקיים ביום ראשון, ה-5.1.2020 בשעה 12:30**
**באודיטוריום המכון למצב מוצק, קומת כניסה**
**The lecture will take place on Sunday, 5.1.2020 at 12:30**
**at the Solid State Institute auditorium, entrance floor**

**Host: Assistant Professor Yoav Sagi**