

## **Seminar**

# **Monitored Quantum Hitting Times on NISQ Platforms**

**Eli Barkai**

**Bar-Ilan University, Israel**

We introduce a time-energy uncertainty relation within the context of monitored quantum dynamics [1]. Previous studies have established that the mean recurrence time, which represents the time taken to return to the initial state, is quantised as an integer multiple of the sampling time, displaying point-wise discontinuous transitions at resonances. Our findings demonstrate that the natural utilisation of the restart mechanism in laboratory experiments [2], driven by finite data collection time spans, leads to a broadening effect on the transitions of the mean recurrence time. Our proposed uncertainty relation captures the underlying essence of these phenomena, by connecting the broadening of the mean hitting time near resonances, to the intrinsic energies of the quantum system and to the fluctuations of recurrence time. Our uncertainty relation has also been validated through remote experiments conducted on an International Business Machines Corporation (IBM) quantum computer. We then discuss fractional quantisation of the recurrence time for interacting spin systems using sub-space measurements [3].

### **References**

- [1] R. Yin, Q. Wang, S. Tornow, and E. Barkai, *Restart uncertainty relation for monitored quantum dynamics Proceedings of the National Academy of Sciences* 122 (1) e2402912121, (2025).
- [2] R. Yin, E. Barkai *Restart expedites quantum walk hitting times Phys. Rev. Lett.* 130, 050802 (2023).
- [3] Q. Liu, S. Tornow, D. Kessler, and E. Barkai *Properties of Fractionally Quantized Recurrence Times for Interacting Spin Models arXiv:2401.09810 [cond-mat.stat-mech] (submitted)*

**Tuesday, Jan 20<sup>th</sup> 2026**

**16:00 Hrs (Tea / Coffee 15:45 Hrs)**

**Auditorium, TIFRH**