



**S N BOSE NATIONAL CENTRE
FOR BASIC SCIENCES**

Block JD, Sector III, Salt Lake, Kolkata 700 106

DEPARTMENTAL SEMINAR

Condensed Matter and Materials Physics

03rd October, 2023

4.00 PM

ONLINE/BOSON

SPEAKER

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TITLE OF THE TALK

IS KINETIC CONSTRAINT SUFFICIENT TO GENERATE QUANTUM MANY-BODY SCARS ?

ABSTRACT

The discovery of "Quantum many-body scars (QMBS)" has been a milestone in many-body physics as it revolutionized our concept about interacting and non-integrable quantum many-body systems. QMBS are atypical eigenstates whose presence weakly violates Eigenstate thermalization hypothesis (ETH) in a system. QMBS were first discovered in kinetically constrained Rydberg atom arrays followed by other systems without kinetic constraint. But ironically the mechanism of scarring in systems with kinetic constraint has remained poorly understood to date. In this talk, I will first briefly review the relevant portion of the literature followed by our contribution in resolving the mystery. I will discuss why higher spin PXP models are ideal platforms to explore the role of kinetic constraint in generating QMBS. Constraint engineering can be used to synthesize non-integrable models with Hilbert space fragmentation, extensive number of conserved quantities and strong ergodicity which I will demonstrate using three different spin-1 PXP models.

References :

- 1) Bernien, H., Schwartz, S., Keesling, A. et al. Probing many-body dynamics on a 51-atom quantum simulator. *Nature* 551, 579–584 (2017).
- 2) Turner, C.J., Michailidis, A.A., Abanin, D.A. et al. Weak ergodicity breaking from quantum many-body scars. *Nature Phys* 14, 745–749 (2018).
- 3) Bhaskar Mukherjee, Zi Cai, and W. Vincent Liu. Constraint-induced breaking and restoration of ergodicity in spin-1 PXP models. *Phys. Rev. Research* 3, 033201 (2021).

HOST FACULTY

Prof. Manoranjan Kumar, Professor
