Contribution ID: **2** Type: **20 Min Talk**

Partial integrability: from three body to many body

Tuesday, 4 July 2023 11:30 (30 minutes)

Novel paradigms of ergodicity breaking have been mushrooming in recent years, most notably in the form of quantum many-body scars. Here I present yet another mechanism of weak ergodicity breaking, in a partially integrable spin chain. Breakdown of integrability in the generic subspaces is manifested with the violation of the Yang-Baxter equation for scattering matrices, but we were nevertheless able to construct antisymmetric and symmetric basis that reveal integrable excited states in the framework of coordinate Bethe Ansatz. These Bethe states in disguise distinguish themselves dynamically from the previously known partial integrability due to Hilbert space fragmentation, as initial states can overlap with both integrable eigenstates and ETH satisfying chaotic ones which leads to slow thermalization.

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Track Classification: Participants Talks