



Department of
Theoretical Physics

THE QUANTUM SPACETIME SEMINAR SERIES

**A Microscopic Model of Black Hole Evaporation in 2-dim. Gravity
(Hybrid Seminar)**

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(ICTS Bangalore)**

Date: November 25, 2022

Time: 10.00 AM IST

Zoom link shall be shared separately

We present a microscopic model of black hole 'evaporation' in asymptotically AdS₂ spacetimes dual to the low energy sector of the SYK model. To describe evaporation, the SYK model is coupled to a bath consisting of free scalar fields using a combination of Kourkoulou-Maldacena (KM) type operators in the Schwinger-Keldysh formalism. We discuss the time evolution of a pure state density matrix of the SYK system, namely a black hole microstate, and a Calabrese-Cardy state of the bath. Tracing over the bath degrees of freedom leads to a Feynman-Vernon type effective action for the SYK model, which we study in the large N and low energy limit. The leading large N behaviour of the time reparameterization mode is found. The subleading fluctuations are characterized by a non-Markovian non-linear stochastic differential equation (SDE) with non-local Gaussian noise. At large times we find two classes of solutions which approach a black hole at a lower temperature or a horizonless geometry. By repeating the dynamical process $\mathcal{O}(N^2)$ times with different choices of the KM operators one can in principle reconstruct the initial black hole microstate.