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An Effective Theory model for Black Hole Membranes from Constraints of Symmetry

Einstein equations projected on Black Hole horizons give rise to the equations of motion of a viscous fluid. This suggests a way to understand the microscopic degrees of freedom on the Black Hole horizon by focusing on the physics of this fluid. In this talk, we shall approach this problem by building a crude model for the Horizon-fluid(HF) corresponding to asymptotically flat Black Holes in 3+1 dimensions. The symmetry requirement for our model is that it should incorporate the S1 diffeo-symmetry on the BH horizon. The second constraint comes from the demand that the correct value of the Coefficient of the Bulk Viscosity of the HF can be deduced from the model in the hydrodynamic limit. Both these requirements can be satisfied by an adoption of the eight vertex Baxter model on a S2 surface. We discuss how this model can also be viewed as an effective theory at comparatively lower energies. The adiabatic entropy quantisation proposed by Bekenstein also follows from this theory. Finally, we argue the results obtained so far suggest that a perturbed Black Hole can be described by a CFT perturbed by relevant operators and discuss the usefulness of the theory in understanding the thermalisation and escape of information at late times.

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