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**Bath induced localisation in interacting one dimensional systems**Saptarshi Majumdar,<sup>1</sup> Laura Foini,<sup>2</sup> Thierry Giamarchi,<sup>3</sup> and Alberto Rosso<sup>1</sup><sup>1</sup> *Université Paris Saclay, CNRS, LPTMS, 91405, Orsay, France*<sup>2</sup> *IPhT, CNRS, CEA, Université Paris Saclay, 91191 Gif-sur-Yvette, France*<sup>3</sup> *Department of Quantum Matter Physics, University of Geneva, 24 Quai Ernest-Ansermet, CH-1211 Geneva, Switzerland*

We study an XXZ spin chain, where each spin is coupled to an independent bath of harmonic oscillators at zero temperature. By varying the strength of the coupling to the bath the chain undergoes a quantum phase transition between a Luttinger liquid phase and a spin density wave (SDW). The SDW emerges in the absence of the opening of a gap, due to the spontaneous symmetry breaking of a continuous symmetry. We also show, by computing the DC conductivity, that the dissipative phase is insulating in the presence of a subohmic bath. Our results highlight that in a many-body system slow baths can induce “localisation” à la Caldeira and Leggett due to annealed dynamical disorder, to be compared with the effect of quenched impurities.