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Quantum critical states and phase transitions in the presence of non equilibrium noise EMANUELE DALLA TORRE, Weizmann Institute of Science, EUGENE DEMLER, Harvard University, THIERRY GIAMARCHI, University of Geneva, EHUD ALTMAN, Weizmann Insitute of Science — Ultracold atomic, molecular or trapped ion systems, offer unique possibilities to realize interesting quantum phases and phase transitions. On the other hand they are easily driven out of equilibrium by external (classical) noise sources. It is natural to expect that noise will destroy the subtle correlations underlying quantum critical behavior. This is indeed the case for thermal noise. Surprisingly we find that the $1/f$ noise, ubiquitous in such systems, does preserve the critical behavior. The emergent states show intriguing interplay of intrinsic quantum-critical and external noise-driven fluctuations. We demonstrate this general phenomenon with several specific examples in solid state and ultracold atomic systems. Our approach shows that genuine quantum phase transitions can be well defined even for systems driven out of equilibrium.

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