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# Dynamical crossovers in prethermal critical states

Alessio Chiocchetta\*<sup>1</sup>

<sup>1</sup>Institute for Theoretical Physics, University of Cologne (ThP) – Zùlpicher StraÙe 77 D-50937 Kùln, Germany

## Abstract

We study the prethermal dynamics of an interacting field theory with a  $N$ -component order parameter and  $O(N)$  symmetry, suddenly quenched in the vicinity of a dynamical critical point. Depending on the initial conditions, the evolution of the order parameter, as well as of response and correlation functions, can exhibit a temporal crossover between universal dynamical scaling regimes governed, respectively, by a quantum and a classical prethermal fixed point, as well as a crossover from Gaussian to prethermal dynamical scaling. Together with a recent experiment, this suggests that quenches can be used in order to explore the rich variety of dynamical critical points occurring in the non-equilibrium dynamics of a quantum many-body system. We illustrate this fact by using a combination of functional renormalization group techniques and a non-perturbative large- $N$  limit.

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\*Speaker