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## Fredrickson-Andersen 2-spin facilitated model: sharp threshold

The Fredrickson-Andersen 2-spin facilitated model (FA-2f) on  $\mathbb{Z}^d$  is a paradigmatic interacting particle system with kinetic constraints (KCM) featuring cooperative and glassy dynamics. For FA-2f vacancies facilitate motion: a particle can be created/killed on a site only if at least 2 of its nearest neighbors are empty. Due to this constraint the process is non-attractive and displays an anomalous divergence of characteristic time scales as the equilibrium density of the empty sites,  $q$ , tends to zero. A natural random variable encoding this feature is the first time at which the origin becomes empty for the stationary process,  $\tau$ . We will prove that in any dimension  $d \geq 2$  w.h.p. it holds

$$\tau \sim \exp\left(\frac{d\lambda(d, 2) + o(1)}{q^{1/(d-1)}}\right)$$

with  $\lambda(d, 2)$  the threshold constant for the 2-neighbour bootstrap percolation on  $\mathbb{Z}^d$ . This is the first sharp result for a critical KCM and settles various controversies accumulated in physics literature over the last four decades. We will explain the dominant relaxation mechanism leading to the above result and give a flavour of the proof techniques. Finally, we will discuss further results that can be obtained via this technique for more general KCM, including full universality results in two dimensions.

[Joint work with I.Hartarsky and F.Martinelli]