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Asymptotics and the sub-limit at L^2-criticality of higher moments for the SHE in dimension $d \geq 3$

In this talk, we consider a renormalization of the d-dimensional stochastic heat equation (SHE) when the mollification parameter is turned off. Recently, the limiting higher moments of the two-dimensional mollified SHE have been established, and a phase transition is found at L^2-criticality. In particular, the non-Gaussianity of the limit is proved. By contrast, the above convergences in high dimensions ($d \geq 3$) still remain unknown. To this aim, we will prove this conjecture by showing a completely opposite phenomenon in high dimensions. Moreover, we will provide partial results for a conjecture about the critical coupling constants of the continuous directed polymer.