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Phase structure of CDT quantum gravity

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Causal Dynamical Triangulations (CDT) is a lattice field theory of quantum gravity based on Regge calculus which can be studied using Monte Carlo techniques. The key feature of CDT is an introduction of a global proper time foliation into spatial hypersurfaces and a requirement that spatial topology is fixed. Measurements showed that CDT parametrized by bare coupling constants of the Regge action has a complicated phase structure. Under spherical topology four phases appeared, and they most likely have a common point, a so called "quadrupole" point. The phase transitions were also measured and it was shown that there exists phase transitions of second or higher order, which opens a possibility of investigating the UV limit. We recently measured the phase structure in toroidal topology that appeared to be quite similar to the one observed in spherical case. This may indicate that the phase structure is independent from the topology of the universe.

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