

CAUSAL DYNAMICAL TRIANGULATIONS ON A TORUS

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Abstract

I will discuss a quantum gravity model defined by four-dimensional Causal Dynamical Triangulations (CDT). Identification of phase structure and order of the phase transitions constitute first steps in the quest for a continuum limit of CDT where, following the asymptotic safety conjecture, the resulting theory of quantum gravity becomes nonperturbatively renormalizable. Previous studies of 4-dim CDT focused on a model with fixed spatial topology of a 3-sphere leading to many interesting results, including identification of four distinct phases of geometry, some of which are separated by second (or higher) order phase transition lines. I will present recent results concerning phase diagram of CDT with spatial topology of a 3-torus and discuss properties of the, so called, phase C whose geometry both in spherical and toroidal case shows good semiclassical behaviour. If time permits, I will also discuss the recent idea of reintroducing semiclassical coordinates in the CDT setup.

References

- [1] J. Ambjørn, Z. Drogosz, J. Gizbert-Studnicki, A. Görlich, J. Jurkiewicz, and D. Németh. Impact of topology in causal dynamical triangulations quantum gravity. *Phys. Rev.*, D94(4):044010, 2016.
- [2] J. Ambjørn, J. Gizbert-Studnicki, A. Görlich, K. Grosvenor, and J. Jurkiewicz. Four-dimensional CDT with toroidal topology. *Nucl. Phys.*, B922:226–246, 2017.
- [3] J. Ambjørn, J. Gizbert-Studnicki, A. Görlich, J. Jurkiewicz, and D. Németh. The phase structure of causal dynamical triangulations with toroidal spatial topology. *Journal of High Energy Physics*, 2018(6):111, Jun 2018.
- [4] J. Ambjørn, Z. Drogosz, J. Gizbert-Studnicki, A. Görlich, and J. Jurkiewicz. Pseudo-Cartesian coordinates in a model of Causal Dynamical Triangulations. arXiv: 1812.10671, 2018.