



Contribution ID: 26

Type: **Talk/Seminar**

Quantum gravity on a torus - an update

Monday 23 September 2019 17:30 (20 minutes)

During last POTOR's conference I discussed a quantum gravity model defined by Causal Dynamical Triangulations (CDT) where spatial slices of equal proper time have fixed topology of a 3-torus. 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. Initial study of the toroidal model, presented last year, showed that one can identify the same phase structure as earlier observed for the spherical spatial topology, including phase 'C', where quantum fluctuations of spatial volume are well described by mini-superspace like models. Now I will also discuss the recent study of the order of phase transitions in the toroidal case, which is crucial in defining the continuum limit of CDT. If time permits I will comment on the possibility of reintroducing spatial coordinates in the CDT model and on the impact of scalar fields with non-trivial boundary conditions on the toroidal CDT results.

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Session Classification: Parallel Sessions

Track Classification: Parallel Sessions