

Exploring Quantum Ricci Curvature in Nonperturbative Quantum Gravity

Joren Brunekreef, Nilas Klitgaard, Renate Loll

*Institute for Mathematics, Astrophysics, and Particle Physics,
Radboud University, Heyendaalseweg 135, 6525 AJ Nijmegen, The Netherlands*

Email: *j.brunekreef@science.ru.nl, n.klitgaard@science.ru.nl, r.loll@science.ru.nl*

Abstract

Quantum curvature observables, which remain well-defined in a Planckian regime, have up to now received little attention in nonperturbative quantum gravity. We recently defined a notion of quantum Ricci curvature, based on measuring sphere distances, which can be evaluated on non-smooth, non-classical metric spaces. Like in the classical continuum, this quantum curvature is a rich and complex quantity, and gives us a new, quantitative tool for investigating the geometric properties of quantum spacetime. Since it can be coarse-grained easily, it also provides us with another test of the classical limit. We report on new results in determining quantum Ricci curvature in Causal Dynamical Triangulations, in dimensions 2 and 4, and for different topologies.

Keywords: nonperturbative quantum gravity, causal dynamical triangulations, Ricci curvature, quantum observables