GR 19: Quantengravitation und Quantenkosmologie I

Zeit: Freitag 12:30–13:15 Raum: HS 6

GR 19.1 Fr 12:30 HS 6

Singularity avoidance in quantum cosmology — Mariam Bouhmadi-López[1], Claus Kiefer[2], and •Manuel Krämer[2] — [1]Instituto de Estructura de la Materia, IEM-CSIC, Serrano 121, 28006 Madrid, Spain — [2]Institut für Theoretische Physik, Universität zu Köln, Zülpicher Straße 77, 50937 Köln, Germany

One of the aims of a theory of quantum gravity is to resolve the singularities appearing in general relativity. In this talk we give an overview of how singularities are avoided in quantum-cosmological models that are dominated by dark energy. We show how one can model universes with different kinds of singularities by choosing specific types of a generalized Chaplygin gas and we present our recent results on how to resolve a certain sub-class of these singularities in a quantum-cosmological approach based on the Wheeler–DeWitt equation.

GR 19.2 Fr 12:45 HS 6

The Schrödinger-Newton equation as a model for self-gravitating quantum systems — •André Grossardt[1,2] und Domenico Giulini[1,2] — [1]Zentrum für angewandte Raumfahrttechnologie und Mikrogravitation (ZARM), Universität Bremen — [2]Institut für theoretische Physik, Leibniz Universität Hannover

The time-dependent Schrödinger-Newton equation can be considered as a model for the gravitational self-interaction of a quantum system. We motivate this model as the non-relativistic limit of a gravitationally interacting relativistic field. Namely, we show that the Schrödinger-Newton equation can be derived in a WKB-like expansion in $1/c$ from the Einstein-Klein-Gordon and Einstein-Dirac system.

GR 19.3 Fr 13:00 HS 6

Supersymmetric Q-balls and boson stars in (d+1) dimensions — Betti Harmann and •Jürgen Riedel — Jacobs University, Bremen

We construct supersymmetric Q-balls and boson stars in $(d+1)$ dimensions. These non-topological solitons are solutions of a scalar field model with global $U(1)$ symmetry. We apply in our work a scalar field potential that appears in gauge-mediated supersymmetry (SUSY) breaking in the minimal supersymmetric extension of the Standard Model (MSSM).

We study the asymptotically flat solutions of such solitons. We show that for our choice of the potential gravitating, asymptotically flat boson stars exist in $(2+1)$ dimensions. We observe that the behaviour of the mass and charge of the asymptotically flat solutions at maximal frequency depends strongly on the number of spatial dimensions. We also find that boson stars with arbitrarily large values of the mass and charge exist for $d \geq 5$ and exhibit some new features. We can also draw conclusions about the stability of these objects with respect to the decay into Q free bosons. In particular we find that the "thick-wall limit" Q-balls are always unstable in flat space-time.