GR 403 Quantengravitation: Loops

Zeit: Donnerstag 14:00–16:00 Raum: K

GR 403.1 Do 14:00 K

The (Extended) Master Constraint Programme for Loop Quantum Gravity — •Thomas Thiemann — Albert Einstein Institut

The Master Constraint Programme constructs the Hilbert space of physical states in Loop Quantum Gravity (LQG). After outlining the programme we show how to obtain approximate physical states and how to perform LQG calculations which relate to physical applications.

GR 403.2 Do 14:20 K

Semiclassical Analysis of the Master Constraint of Loop Quantum Gravity — •Kristina Giesel and Thomas Thiemann — Albert-Einstein-Institut

The whole dynamics of Loop Quantum Gravity is encoded in the so called Master Constraint. We show that the expectation values of the Master Constraint of Loop Quantum Gravity with respect to coherent states reproduce the correct semiclassical limit.

GR 403.3 Do 14:40 K

On the physical inner product of Quantum Gravity — •Benjamin Bahr — Albert-Einstein Institut, Am Muehlenberg 1, 14476 Golm/Potsdam

Additionally to solving the constraints in Loop Quantum Gravity, one of the still unsettled questions is how to equip the space of solutions with an inner product that allows for a physical interpretation of the theory. It will be shown how the combined techniques of Master constraint and coherent states provide an error-controlled approximation scheme for such a physical inner product. Furthermore, the scheme is tested on a simple cosmological model.

GR 403.4 Do 15:00 K

Inhomogeneities in Loop Quantum Gravity — •Martin Bojowald — Institute for Gravitational Physics and Geometry, The Pennsylvania State University, University Park, PA 16802, USA

While several characteristic properties of general relativity, such as singularities, can already be seen in homogeneous situations, detailed physical applications require inhomogeneities. This is relevant for cosmology and black holes, and can be introduced by perturbations or by midisuperspace reduction. Corresponding derivations at the quantum level then show modifications to classical equations on small length scales which can have significant implications. Applications are the fate of classical singularities, structure formation in cosmology, and black hole evaporation.

GR 403.5 Do 15:20 K

Discrete Geometry from Loop Quantum Gravity? — •Johannes Brunnemann[1] and David Rideout[2] — [1]MPI fuer Gravitationsphysik, Am Muehlenberg 1, 14476 Potsdam (Golm), GERMANY — [2]Imperial College London, South Kensington campus, Prince Consort Road, London SW7 2AZ, UK

A quantum theory of gravity is expected to contain a discrete geometrical structure at scales close to the Planck length ℓ_P. In this talk we will present first results of a detailed study towards answering this question within the framework of Loop Quantum Gravity (LQG). Here the operator $\hat{V}$ corresponding to the classical expression of the volume $V(R)$ of a spatial region R plays a central role: it nicely relates classical geometrical properties to the abstract combinatorical structure of LQG, moreover it is a crucial object to enable calculations in order to gain information about physical properties of the full theory.

GR 403.6 Do 15:40 K

Quantum Cosmological Perturbation Theory — •Stefan Hofmann — Perimeter Institute for Theoretical Physics

Within a minisuperspace truncation of Loop Quantum Gravity we derive the deviations from scale invariance in the power spectrum of the CMBR.