

MP 7: Quanten+Gravitation 1

Zeit: Mittwoch 14:45–16:00

Raum: HS 8

MP 7.1 Mi 14:45 HS 8

Invariant Connections and symmetry Reduction in Loop Quantum Gravity — ●MAXIMILIAN HANUSCH — Univ. Paderborn

The notion of invariant connections on principal fibre bundles plays a crucial role for symmetry reduction in particular in the framework of loop quantum gravity. Usually symmetries are represented by Lie groups of automorphisms of the underlying bundle. The corresponding invariant connections then provide a starting point for the construction of a reduced quantum configuration space. In this talk we will introduce a rather algebraic characterization of such connections that often allows for explicit calculations. We apply this result to the isotropic connections to be used in loop quantum cosmology. If time permits, we will highlight an alternative way to define a reduced quantum configuration space.

MP 7.2 Mi 15:10 HS 8

Hamiltonian dynamics of a quantum of space: hidden symmetries and spectrum of the volume operator, and discrete orthogonal polynomials — VINCENZO AQUILANTI¹, ●DIMITRI MARINELLI², and ANNALISA MARZUOLI³ — ¹Dipartimento di Chimica, Università di Perugia and I.M.I.P., C.N.R. Roma, Italy

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The action of the quantum mechanical volume operator, introduced in

connection with a symmetric representation of the three-body problem and recently recognized to play a fundamental role in discretized quantum gravity models, can be given as a second order difference equation which, by a complex phase change, we turn into a discrete Schrödinger-like equation. The introduction of discrete potential-like functions reveals the surprising crucial role here of the Regge symmetries, first discovered for the quantum mechanical $6j$ symbols; insight is provided into the underlying geometric features. The spectrum and wavefunctions of the volume operator are discussed from the viewpoint of the Hamiltonian evolution of an elementary “quantum of space”, and a transparent asymptotic picture emerges of the semiclassical and classical regimes. The definition of coordinates adapted to Regge symmetry allows the construction of a novel set of discrete orthogonal polynomials.

MP 7.3 Mi 15:35 HS 8

Towards brane-worlds in Yang-Mills matrix models — ●HAROLD STEINACKER — Fakultät für Physik, Universität Wien

Brane solutions of Yang-Mills matrix models with 4 noncompact directions are discussed, focusing on the dynamics of the geometry and the low-energy physics on such branes. We show that matter leads to a perturbation of the 4-dimensional geometry and to some type of effective gravity in the matrix model, without invoking an Einstein-Hilbert term. This requires the presence of compactified extra dimensions with extrinsic curvature. We also sketch how the field content of the standard model fields can be realized in such a scenario.