



General Relativity and Quantum Cosmology

Towards Loop Quantum Supergravity (LQSG)

Norbert Bodendorfer, Thomas Thiemann, Andreas Thurn

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Should nature be supersymmetric, then it will be described by Quantum Supergravity at least in some energy regimes. The currently most advanced description of Quantum Supergravity and beyond is Superstring Theory/M-Theory in 10/11 dimensions. String Theory is a top-to-bottom approach to Quantum Supergravity in that it postulates a new object, the string, from which classical Supergravity emerges as a low energy limit. On the other hand, one may try more traditional bottom-to-top routes and apply the techniques of Quantum Field Theory. Loop Quantum Gravity (LQG) is a manifestly background independent and non-perturbative approach to the quantisation of classical General Relativity, however, so far mostly without supersymmetry. The main obstacle to the extension of the techniques of LQG to the quantisation of higher dimensional Supergravity is that LQG rests on a specific connection formulation of General Relativity which exists only in $D+1 = 4$ dimensions. In this Letter we introduce a new connection formulation of General Relativity which exists in all space-time dimensions. We show that all LQG techniques developed in $D+1 = 4$ can be transferred to the new variables in all dimensions and describe how they can be generalised to the new types of fields that appear in Supergravity theories as compared to standard matter, specifically Rarita-Schwinger and p-form gauge fields.

Comments: 9 pages. v2: minor improvements in presentation, virtually identical to published version

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