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Quantization of plane gravitational waves

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A long-standing problem in Loop Qauntum Gravity (LQG) is the semiclassical limit and the question of Lorentz invariance violation due to the "granularity" of quantum space-time. In full 3+1 LQG there are strong indications for such violations, but no definitve answer to this issue has been given so far.
Unidirectional plane gravitational waves are 1+1 dimensional fully general-relativistic systems, which are convenient for an investigation of possible dispersion of gravitational radiation, quantum fluctuations of flat space, and the speed of light in a quantum space-time environmant.
In a recent paper a classical canonical approach to plane waves was found, where the reduction from arbitrarily forth- and back running waves to unidirectional ones is formulated in terms of first-class constraints. This means that this step of symmetry reduction can be carried out after quantization. The presently ongoing work deals with the formulation of the corresponding quantum constraint operators and the construction of solutions.