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Department of
Theoretical Physics

Theory Colloquium

Wolfgang Wieland, Institute for Quantum Gravity, Erlangen
"Quantum Geometry of the Light Cone"

Abstract

In relativity, the light cone, which emanates from a given
event, separates causally connected from causally disconnected events in
spacetime. Under the influence of gravity, the light cones bend. A
previously expanding light cone can fall back into itself. In this way,
the causal structure of spacetime becomes itself dynamical. In my talk,
I will explain how to understand this link between gravity, geometry and
causality at the quantum level. This is, in fact, an exciting problem
common to different approaches to quantum gravity, from holography, to
the perturbative S-matrix approach and loop quantum gravity. I will
report on three new results on this frontier. First, I provide a
non-perturbative characterization of the gravitational phase space on a
light cone. Second, the description is taken to the quantum level.
Third, an immediate physical implication is found: in the model, the
Planck luminosity separates the eigenvalues of the radiated
gravitational wave power. Below the Planck power, the spectrum of the
radiated power is discrete. Above the Planck power, the spectrum is
continuous and the resulting physical states contain caustics that can
spoil the semi-classical limit. The talk is based on arXiv:2402.12578,
arXiv:2401.17491, arXiv:2104.05803.

Wednesday | 04.12.2024 | 5:00pm

SR 1 | ICT building