

Title: Well-posed Cauchy formulation for Einstein-aether theory

Abstract: We discuss the well-posedness of the Cauchy problem of vacuum Einstein-aether theory. The latter is a Lorentz-violating gravitational theory consisting of General Relativity with a dynamical timelike ``aether'' vector field, which selects a preferred time direction at each spacetime event. The Einstein-aether action is quadratic in the gradient of the aether, and thus yields second-order field equations for the metric and the aether. However, in general the structure of these equations is rather complicated, and this makes it difficult to formulate a well-posed Cauchy problem away from the simple case of linearized perturbations over flat spacetime. In this talk we employ a first-order formulation of Einstein-aether theory in terms of projections on a tetrad frame and show that under suitable conditions on the coupling constants of the theory, the resulting evolution equations can be cast into strongly or even symmetric hyperbolic form, and therefore they define a well-posed Cauchy problem.