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Gauge-invariant approach to the parameterized post-Newtonian formalism

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The parameterized post-Newtonian (PPN) formalism is an invaluable tool to assess the viability of gravity theories using a number of constant parameters. These parameters form a bridge between theory and experiment, as they have been measured in various solar system experiments and can be calculated for any given theory of gravity. The practical calculation, however, can become rather cumbersome, if the field equations involve couplings to additional fields. In addition, the PPN formalism relies on the choice of a particular gauge (or coordinate system), which is determined only after solving the field equations. These difficulties can be overcome by applying a gauge invariant formalism, which is conventionally used in cosmological perturbation theory. The particular nature of the PPN formalism requires perturbations of at least quadratic order to be considered, as well as a different treatment of space and time directions. In my talk I show how to develop such kind of formalism for gravity theories in metric and tetrad formulation and give prospects on how to generalize this treatment to higher perturbation orders necessary for calculating high precision orbital motion.

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