GR 1: Grundlegende Probleme und allgemeiner Formalismus

Zeit: Montag 17:00–18:00 Raum: A214

GR 1.1 Mo 17:00 A214

On the initial-value problem of Maxwell's equations — •Volker Perlick — Physics Department, Lancaster University, UK

I present some new results on the initial-value problem for Maxwell's equations. Throughout, Maxwell's equations are considered in metric-free form, with a local but otherwise arbitrary constitutive law. This setting covers standard Maxwell theory on a general-relativistic space-time and many alternative theories as special cases. The general results are illustrated with applications to the Born-Infeld nonlinear electrodynamic theory. Among other things, I present a new proof of the known fact that the Born-Infeld initial-value problem is well-posed.

GR 1.2 Mo 17:20 A214

The physics of higher order equations of motion — •Patricia Rademaker and Claus Lämmerzahl — ZARM, University Bremen, 28359 Bremen

On the classical level interactions are explored through the observation of the dynamics of particles. The basic underlying assumption in that scheme is that Newton's second law holds. We relax the validity of this axiom by assuming higher order time derivatives in the equation of motion. We discuss the physics emerging from such higher order equations of motion and derive the structure of interactions which can be deduced from a gauge principle. One main result is that modifications in the particle motion due to higher order derivatives induce a zitterbewegung. As a consequence the main motion resulting from the second order equation of motion is rather robust against such modifications. Higher order equations of motion also allow for a more general structure of interactions. In particular, this approach also serves as a novel scheme to introduce the Riemannian space-time metric on a gauge level. We confront this general scheme with experimental data.

GR 1.3 Mo 17:40 A214

Averaged Gravity — •Juliane Behrend — Institut für Theoretische Physik, Universität Ulm

The fact that an adequate description of gravitational dynamics on cosmological scales should be given by an average over Einstein's equations is currently receiving considerable attention. Finding an accurate theory of averaged gravity is difficult since we lack a suitable averaging procedure for tensor quantities in general relativity. In this talk I will discuss in depth various approaches to such a procedure and address remaining problems that need to be overcome to find a viable averaged theory.