GR 5: Klassische Allgemeine Relativitätstheorie II

Zeit: Dienstag 16:45–18:05 Raum: A214

GR 5.1 Di 16:45 A214

Gravitating Sphaleron-Antisphaleron Systems — Rustam Ibadov[1], Burkhard Kleihaus[2], Jutta Kunz[2], and •Michael Leissner[2] — [1]Department of Theoretical Physics and Computer Science, Samarkand State University, Samarkand, Uzbekistan — [2]Institut für Physik, Universität Oldenburg, D-26111 Oldenburg, Germany

The configuration space of the bosonic sector of Yang-Mills-Higgs theory possesses non-trivial topology. This gives rise to a plethora of unstable classical solutions, such as the Klinkhamer-Manton sphaleron. Representing a saddlepoint of the energy functional between two topologically inequivalent vacua, its existence permits processes, which violate baryon number conservation.

We here present new solutions to Einstein-Yang-Mills-Higgs theory, representing gravitating sphaleron-antisphaleron pairs, chains and vortex rings. In these static axially symmetric solutions, the Higgs field vanishes on isolated points on the symmetry axis, or on rings centered around the symmetry axis.

GR 5.2 Di 17:05 A214

Motion of extended bodies in the theory of general relativity — •Isabell Schaffer and Claus Lämmerzahl — ZARM, Universität Bremen, Am Fallturm, D-28359 Bremen

The geodesic equation in General Relativity holds for ideal point particles only. If e.g. intrinsic angular momentum is associated with a particle, the particle must have an extension, to avoid physical inconsistency. Moreover, spin and mass quadrupole couple to the curvature of spacetime. As a consequence, the equations of motion will be modified. For the description of these extended bodies with spin the Mathisson–Papapetrou formalism can be used (MP–formalism) which we will apply on a particle in a Kerr–de Sitter background space time. The equations of the MP-formalism have to be completed by a supplementary condition. We want to apply different supplementary conditions which are mainly used in literature on a Kerr–de Sitter spacetime and discuss the different effects. The results of this analysis may be useful in the description of satellite dynamics oder binary systems of stars.

GR 5.3 Di 17:25 A214

Interaktive Visualisierung in der Allgemeinen Relativitätstheorie — •Thomas Müller und Frank Grave — Visualisierungsinstitut der Universität Stuttgart

Die Visualisierung in der Relativitätstheorie ermöglicht uns Einblicke in die Natur von Raum und Zeit, die uns aus unserer Alltagserfahrung vollkommen fremd sind. Sie dient hierbei nicht nur dazu, die Relativitätstheorie einer breiten Öffentlichkeit zugänglich zu machen, sondern kann auch als wichtiges pädagogisches Hilfsmittel in Schule und Studium eingesetzt werden. Während die Effekte der Speziellen Relativitätstheorie relativ einfach in eine interaktive Simulation umgesetzt werden können, sind die Effekte der Allgemeinen Relativitätstheorie bisher nur durch aufwendige mathematische Rechnungen zu veranschaulichen. Im Falle einfacher Geometrien ist jedoch eine interaktive Visualisierung mit Hilfe analytischer Lösungen der Geodätengleichungen möglich. Die notwendigen theoretischen Grundlagen werden anhand der Schwarzschild-, der Morris-Thorne-, sowie der Gödel-Raumzeit diskutiert. Im Anschluss ist eine kurze Vorführung möglich.

GR 5.4 Di 17:45 A214

The Schwarzschild solution and its implications for gravitational waves — •Stephen J. Crothers — P.O. Box 1546, Sunshine Plaza, 4558, Queensland, Australia

The so-called Schwarzschild solution is not Schwarzschild's solution. The quantity r in the so-called Schwarzschild solution has never been rightly identified by the physicists. The said quantity r is in fact the inverse square root of the Gaussian curvature of a spherically symmetric geodesic surface in the spatial section, not in itself a distance in that manifold. It is easily proven that there is only one singularity associated with Schwarzschild spacetime. The standard removal of the singularity at r = 2m is, in a very real sense, removal of the wrong singularity. Consequently, there are no black holes associated with the field equations Ric = 0 and therefore no related gravitational waves. It is also shown that Ric = 0 violates Einstein's Principle of Equivalence. This has major implications for gravitational waves.