GR 5: Schwarze Löcher – Lösungen I

Zeit: Dienstag 8:30–10:30 Raum: ZHG 002

GR 5.1 Di 8:30 ZHG 002

Gravitational objects in the presence of a minimal length — Piero Nicolini[1], •Alessio Orlandi[2], and Euro Spallucci[3] — [1]Frankfurt Institute for Advanced Studies (FIAS) and Institut fur Theoretische Physik, u Johann Wolfgang Goethe-Universitaet, Frankfurt am Main, Germany — [2]Dipartimento di Fisica, Universita' di Bologna and INFN, Sezione di Bologna, Italy — [3]Dipartimento di Fisica, Universita' di Trieste and INFN, Sezione di Trieste, Italy

In this contribution I will present a new family of gravitational objects representing gravitational matter shells. The key feature of these geometries is the presence of a minimal length. The latter can be implemented by considering an effective stress tensor, whose time-time component is governed by higher momentum of the Gaussian distribution. By solving Einstein equations, one finds that the resulting geometries describe singularity-free black holes with no, one or two horizons. By studying the Hawking temperature, I will show how the inclusion of the minimal length improves usual problems of terminal phase of the evaporation. Finally I will mention further developments in the direction of brane world black holes.

GR 5.2 Di 8:50 ZHG 002

Phenomenology of quantum gravity black holes — •Piero Nicolini[1], Jonas Mureika[2], Euro Spallucci[3], and Elizabeth Winstanley[4] — [1]Johann Wolfgang Goethe Universität, Frankfurt am Main, Germany — [2]Loyola Marymount University, Los Angeles, CA, USA — [3]Università di Trieste and INFN, Sezione di Trieste, Trieste, Italy — [4]The University of Sheffield, Sheffield, United Kingdom

In this contribution we present a new scenario for the production and the evaporation of microscopic black holes in the presence of a quantum gravity induced fundamental length. After a brief analysis of the existing families of quantum gravity improved black hole geometries, we focus on their common thermodynamic behavior, namely the presence of a phase transition to a positive heat capacity cooling down in the final stages of the evaporation even in the non-rotating, neutral case. This fact has important repercussions of the evaporation spectra in terms of new profiles of grey body factors. Quantum gravity black holes would emit soft particles mainly on the brane, a distinctive signatures in marked contrast to results obtained with classical metrics. Then we present a first step in modeling black hole production in a post-semiclassical limit, by employing an effective ultraviolet cut off. We show that the new cross sections approach the usual "black disk" form at high energy, while they differ significantly near the fundamental scale. If this behavior is confirmed by all the class of quantum gravity black holes, such novel phenomenology is beyond the reach of current accelerators experiments, but is still potentially observable in ultra-high energy cosmic ray collisions.

GR 5.3 Di 9:10 ZHG 002

A scalar condensation instability of hyperbolic black holes in Anti-de Sitter space-time — •Betti Hartmann[1] and Yves Brihaye[2] — [1]School of Engineering and Science, Jacobs University Bremen, 28759 Bremen — [2]Faculte de Sciences, Universite de Mons, 7000 Mons, Belgium

In this talk, I will discuss the stability of static, hyperbolic Gauss-Bonnet black holes in (4+1)-dimensional Anti-de Sitter (AdS) spacetime against scalar field condensation. This instability occurs when the black holes are close to extremality. The resulting solutions are *hairy* black holes that are labelled by the number of nodes of the scalar field function.

GR 5.4 Di 9:30 ZHG 002

Black Holes in Einstein-Gauss-Bonnet Theory — Yves Brihaye[1], Burkhard Kleihaus[2], •Jutta Kunz[2], and Eugen Radu[2] — [1]University of Mons, Belgium — [2]University of Oldenburg

We construct rotating black hole and black ring solutions in Einstein-Gauss-Bonnet theory in five spacetime dimensions, corresponding to the generalization of the Myers-Perry black holes and the Emparan-Reall black rings. These black holes are asymptotically flat and possess a regular horizon. We discuss the physical properties of these black holes and study their dependence on the Gauss-Bonnet coupling constant α.

GR 5.5 Di 9:50 ZHG 002

Spinning black strings in $d = 5$ Einstein-Gauss-Bonnet theory — Jutta Kunz[1], Eugen Radu[1], and •Bintoro Anang Subagyo[1,2] — [1]Institut für Physik, Universität Oldenburg, — [2]Jurusan Fisika, Institut Teknologi Sepuluh Nopember, Surabaya 60111, Indonesia

We construct new uniform black string solutions in Einstein-Gauss-Bonnet theory for $d = 5$ dimensions. Our solutions are rotating and approach asymptotically the four dimensional Minkowski-space times a circle. The solutions are constructed by solving numerically the equations of the model. We discuss the properties of these black objects, in particular the dependence on the Gauss-Bonnet coupling constant α.

GR 5.6 Di 10:10 ZHG 002

Bidifferential calculus approach to solutions of the Ernst equations — Aristophanes Dimakis[1], •Nils Kanning[2], and Folkert Müller-Hoissen[3] — [1]Department of Financial and Management Engineering, University of the Aegean, Chios, Greece — [2]Institute for Mathematics and Institute for Physics, Humboldt University, Berlin, Germany — [3]Max-Planck-Institute for Dynamics and Self-Organization, Göttingen, Germany

The "bidifferential calculus framework" (see also the talk by Folkert Müller-Hoissen) provides an abstract formulation of many features of "integrable" partial differential and difference equations. A special solution generating method in this framework has been used to construct in particular "multi-soliton" solutions of various integrable equations. Recently this result has been applied to the Ernst equations (arXiv:1106.4122), which are the central part of the stationary axially symmetric Einstein vacuum and Einstein-Maxwell equations. Based on this work, we present a derivation of the multi-Kerr-NUT solutions and their electrically and magnetically charged generalizations, the multi-Demiański-Newman spacetimes.