GR 201 Einstein-Yang-Mills-Higgs, Skyrmionen und Bosonensterne

Zeit: Dienstag 10:30–12:30 Raum: K

Hauptvortrag

GR 201.1 Di 10:30 K

Surprises with Rotating Black Holes — •Jutta Kunz[1], Burkhard Kleihaus[1], and Francisco Navarro-Lerida[2] — [1]Universität Oldenburg — [2]Universidad Complutense de Madrid, Spain

In $D = 4$ Einstein-Maxwell theory rotating black holes with regular horizons are uniquely characterized by their global charges. This black hole "no-hair" theorem does not generalize to theories with non-Abelian fields nor to higher dimensions.

In Einstein-Yang-Mills theory rotating hairy black holes arise. These stationary axially symmetric black holes are asymptotically flat, and possess non-trivial non-Abelian electric and magnetic fields outside their regular event horizon.The black holes possess an electric dipole moment. But the rotation can also induce a non-Abelian electric charge. The rotating black hole solutions satisfy a mass formula, similar to the Smarr formula.

In $D = 4$ Einstein-Maxwell-dilaton theory and $D = 5$ Einstein-Maxwell-Chern-Simons (EMCS) theory stationary charged black holes exist, whose horizon angular velocities vanish. Thus their horizon is nonrotating, although their angular momentum is nonzero. The effect of rotation on the horizon is not to make it rotate but to deform it into a squashed sphere. Furthermore, rotating black holes appear, whose horizon can rotate in the opposite sense to their angular momentum. Moreover, in $D = 5$ EMCS theory, black holes with a rotating horizon but vanishing total angular momentum are present, and black holes are no longer uniquely determined by their global charges.

GR 201.2 Di 11:10 K

Gravitating stationary dyons and rotating vortex rings — •Ulrike Neemann, Burkhard Kleihaus und Jutta Kunz — Universität Oldenburg

We discuss dyons and electrically charged monopole-antimonopole pairs and vortex rings in Einstein-Yang-Mills-Higgs theory. The solutions are stationary, axially symmetric and asymptotically flat. In monopole-antimonopole pair solutions the Higgs field vanishes at two discrete points along the symmetry axis. In vortex solutions the Higgs field vanishes on a ring, centered around the symmetry axis. The dyons with magnetic charge $n \geq 2$ represent non-static solutions with vanishing angular momentum. In contrast to the dyons the monopole-antimonopole pairs and vortex rings possess vanishing magnetic charge, but finite angular momentum, equaling n times their electric charge. We observe that two branches of solutions cross at a certain value of the coupling constant α_{cr} before they merge. Monopole-antimonopole pairs with doubly charged poles show a transition to vortex rings at a value α_{vr}.

GR 201.3 Di 11:30 K

Platonic sphalerons in Einstein-Yang-Mills and Yang-Mills-dilaton theory — •Kari Myklevoll, Burkhard Kleihaus, and Jutta Kunz — Universität Oldenburg

Gravitating classical solutions in Yang-Mills (YM) theories have many suprising properties. For instance, black holes in these theories can possess "hair", i. e. non-trivial YM fields not corresponding to global charges. In contrast Einstein-Maxwell (EM) black holes are completely determined by their global charges. Moreover in EM theory, all static black holes are spherically symmetric, whereas static axially symmetric black hole solutions have been found in Einstein-Yang-Mills (EYM) theory.

We here present new sphaleron solutions in EYM and Yang-Mills-dilaton theory. These sphalerons have no continuous rotational symmetries at all, but have the symmetries of crystals or of platonic bodies, and we therefore call them platonic sphalerons. Their symmetries are related to certain rational maps of degree N.

Since the gravitating platonic sphalerons are static regular solutions without continuous symmetries, they belong to a completely new kind of gravitating solutions, and most importantly these solutions indicate the existence of static black holes with only discrete symmetries of the horizon.

GR 201.4 Di 11:50 K

Gravitating Multi-Skyrmions — •Burkhard Kleihaus[1], Theodora Ioannidou[2], and Jutta Kunz[1] — [1]Universität Oldenburg — [2]Aristotle University of Thessaloniki

Gravitating multi-Skyrmion configurations with either discrete platonic symmetry or axial symmetry are investigated numerically. We use the harmonic map Ansatz for the Skyrmion field and a simplified Ansatz for the metric to obtain approximate solutions of multi-Skyrmions coupled to gravity. These solutions are static and asymptotically flat. The symmetry of the solutions is imposed by the choice of the harmonic map. We present axially symmetric solutions with baryon number $B = 2, 3, 4$, as well as the tetrahedral $B = 3$ and cubic $B = 4$ solutions. We show that for fixed baryon number (and given symmetry) two branches of gravitating multi-Skyrmions exist, which merge at a maximal value of the coupling parameter.

GR 201.5 Di 12:10 K

Rotating Boson Stars and Q–Balls — •Meike List[1], Jutta Kunz[2], and Burkhard Kleihaus[2] — [1]Universität Bremen, Am Fallturm, 28359 Bremen — [2]Carl v. Ossietzky Universität Oldenburg, Postfach 2503, 26111 Oldenburg

We consider rotating boson stars, corresponding to rotating generalisations of the scalar soliton stars of Friedberg, Lee and Pang. They are axially symmetric and asymptotically flat. Their flat space limits represent spinning Q-balls.