GR 7 Einstein-Yang-Mills-Higgs

Zeit: Freitag 18:15–19:00 Raum: TU BH262

GR 7.1 Fr 18:15 TU BH262

Platonic Sphalerons in the Presence of a Dilaton Field — •Kari Myklevoll, Burkhard Kleihaus, and Jutta Kunz — Universität Oldenburg

When gravity is coupled to non-Abelian gauge theories a number of interesting phenomena arise, such as gravitationally bound monopoles. Since the coupling of gravity to Yang-Mills or Yang-Mills-Higgs theory has a very similar effect concerning the existence of classical solutions as the coupling to a scalar dilaton, we construct sphaleron solutions with discrete symmetries in Yang-Mills-Higgs-dilaton theory. We consider this study as a first step to obtain self-gravitating objects with only discrete symmetries. Related to rational maps of degree N, these platonic sphalerons can be assigned a Chern-Simons number $Q = N/2$. We present sphaleron solutions with degree $N = 1 - 4$, possessing spherical, axial, tetrahedral and cubic symmetry. For all these sphalerons two branches of solutions exist, which bifurcate at a maximal value of the dilaton coupling constant.

GR 7.2 Fr 18:30 TU BH262

Gravitating Monopole-Antimonopole Chains and Vortex Rings — •Burkhard Kleihaus, Jutta Kunz, and Yasha Shnir — University of Oldenburg

We construct monopole-antimonopole chain and vortex solutions in Yang-Mills-Higgs theory coupled to Einstein gravity. The solutions are static, axially symmetric and asymptotically flat. They are characterized by two integers (m, n) where m is related to the polar angle and n to the azimuthal angle. Solutions with $n = 1$ and $n = 2$ correspond to chains of m monopoles and antimonopoles. Here the Higgs field vanishes at m isolated points along the symmetry axis. Larger values of n give rise to vortex solutions, where the Higgs field vanishes on one or more rings, centered around the symmetry axis. When gravity is coupled to the flat space solutions, a branch of gravitating monopole-antimonopole chain or vortex solutions arises, and bifurcates at a maximal value of the coupling constant with a second branch of solutions. This second branch has no flat space limit. Instead in the limit of vanishing coupling constant and thus vanishing Higgs field, it either ends in known Einstein-Yang-Mills solutions or, for $m > 4$, $n > 4$, it ends in new Einstein-Yang-Mills solutions, and, in this case, further branches of solutions appear.

GR 7.3 Fr 18:45 TU BH262

Rotating Black Holes with Monopole Hair — •Jutta Kunz[1], Burkhard Kleihaus[1], and Francisco Navarro-Lerida[2] — [1]University of Oldenburg — [2]Universidad Complutense de Madrid

We study rotating black holes in Einstein-Yang-Mills-Higgs theory. These black holes emerge from static black holes with monopole hair when a finite horizon angular velocity is imposed. At critical values of the horizon angular velocity and the horizon radius, they bifurcate with embedded Kerr-Newman black holes. The non-Abelian black holes possess an electric dipole moment, but no electric charge is induced by the rotation. We deduce that gravitating regular monopoles possess a gyroelectric ratio $g_{\rm el} = 2$.