GR 6: Numerische Relativitätstheorie

Zeit: Dienstag 16:45–18:05 Raum: KGI-HS 1010

GR 6.1 Di 16:45 KGI-HS 1010

Rotating Boson Stars and Q-Balls II: Negative Parity and Ergoregions — Burkhard Kleihaus[2], Jutta Kunz[1], Meike List[2], and •Isabell Schaffer[2] — [1]Institut für Physik, Universität Oldenburg, D-26111 Oldenburg — [2]ZARM, Universität Bremen, Am Fallturm, D-28359

We construct axially symmetric, rotating boson stars with positive and negative parity. Their flat space limits represent spinning Q-balls. Q-balls and boson stars exist only in a limited frequency range. The coupling to gravity gives rise to a spiral-like frequency dependence of the mass and charge of boson stars. We analyze the properties of these solutions, in particular, the presence of ergoregions in boson stars, and determine their domains of existence.

GR 6.2 Di 17:05 KGI-HS 1010

How to Slice a Black Hole Safely — Mark Hannam[1], Sascha Husa[2], •Frank Ohme[1], Bernd Brügmann[1], and Niall O Murchadha[3] — [1]Theoretical Physics Institute, University of Jena, Germany — [2]Max Planck Institute for Gravitational Physics (Albert Einstein Institute), Potsdam, Germany — [3]Physics Department, University College Cork, Ireland

In Numerical Relativity, the freedom to choose appropriate coordinates that represent the spactime becomes of great importance. Recent success in numerical simulations suggest that particular gauge conditions, which fix the choice of coordinates, are well adapted to the physical properties of black hole systems. We investigate how such a set of gauge conditions (in particular the "1+log" lapse) works in the case of a single Schwarzschild black hole. Among other things, Carter-Penrose diagrams are presented that illustrate how the numerical grid avoids the physical singularity and approaches an analytically predicted stationary foliation.

GR 6.3 Di 17:25 KGI-HS 1010

Numerical simulations of high energy collisions of black holes — •Ulrich Sperhake — FSU Jena, Germany

We present numerical simulations of collisions of black holes with varying boost parameter. This study covers the range from vanishing initial boost to the regime where the total mass is dominated by the kinetic energy. The resulting horizon properties and gravitational wave emission are studied and compared with analytic predictions.

GR 6.4 Di 17:45 KGI-HS 1010

Computing the Event Horizon for Binary Black Hole Systems — •Marcus Thierfelder — Theoretical Physics Institute, University of Jena, Germany

I present results of an event horizon finder for full 3D numerical simulations in general relativity. The algorithm implements the method developed by Peter Diener. It works by evolving a complete null surface backwards in time, where the null surface is described as a level set of a scalar function. The code can handle numerical spacetimes which are created by the BAM code. So it is possible to calculate the event horizon for the case of two black holes that inspiral for several orbits and merge to one final black hole.