GR 24: Numerical Relativity II

Time: Thursday 17:15–18:15 Location: SPA SR220

GR 24.1 Thu 17:15 SPA SR220

Mergers of binary neutron stars with realistic spin — •Tim Dietrich[1], Sebastiano Bernuzzi[1], Wolfgang Tichy[2], and Bernd Brügmann[1] — [1]Theoretical Physics Institute, University of Jena, 07743 Jena, Germany — [2]Department of Physics, Florida Atlantic University, Boca Raton, FL 33431 USA

Binary neutron star mergers are a primary source of gravitational waves. We present the first, fully nonlinear general relativistic dynamical evolutions of the last three orbits for constraint satisfying initial data of spinning neutron star binaries. The dynamics of the systems is analyzed in terms of gauge-invariant binding energy vs. orbital angular momentum curves. By comparing to a binary black hole configuration we can estimate the different tidal and spin contributions to the binding energy for the first time. Additionally, a frequency shift in the main emission mode of the hyper massive neutron star is observed. Our results suggest that a detailed modeling of merger waveforms requires the inclusion of spin, even for the moderate magnitudes observed in binary neutron star systems.

GR 24.2 Thu 17:35 SPA SR220

Einstein-matter dynamics with a hyperboloidal evolution code — •Oliver Rinne — Albert-Einstein-Institut, Potsdam

In hyperboloidal evolution, spacetime is foliated by spacelike hypersurfaces approaching future null infinity, thereby avoiding any problems arising from an artificial timelike boundary. With V. Moncrief we developed a conformal constrained 3+1 formulation of the Einstein equations on such a foliation. In this talk I will present some new numerical results on evolutions of Yang-Mills and/or massive scalar fields coupled to the Einstein equations, focusing on the dynamical role played by nontrivial static solutions.

GR 24.3 Thu 17:55 SPA SR220

An axisymmetric formulation in spherical coordinates — Oliver Rinne and •Christian Schell — Max Planck-Institute for Gravitational Physics, Golm

In this talk we present a new formulation for a non-rotating axisymmetric spacetime in vacuum. The majority of formulations for this situation uses cylindrical coordinates. In contrast to those we introduce spherical coordinates. A general problem for both choices of coordinate systems in axisymmetry is the occurrence of a coordinate singularity at the axis of symmetry. Spherical harmonics are manifestly regular at the axis and hence take care of that issue automatically. Therefore we express all our variables in the corresponding harmonics. We also address the question of an appropriate gauge choice.