GR 16: Numerische Relativitätstheorie

Zeit: Donnerstag 17:25–18:25 Raum: JUR K

GR 16.1 Do 17:25 JUR K

Toward a dynamical shift condition for unequal mass black hole binary simulations — •Doreen Müller, Jason Grigsby, and Bernd Brügmann — Theoretisch-Physikalisches Institut, FSU Jena

Moving puncture simulations of black hole binaries rely on a specific gauge choice that leads to approximately stationary coordinates near each black hole. Part of the shift condition is a damping parameter, which has to be properly chosen for stable evolutions. However, a constant damping parameter does not account for the difference in mass in unequal mass binaries. We introduce a position dependent shift damping that addresses this problem. Although the coordinates change, the changes in the extracted gravitational waves are small.

GR 16.2 Do 17:45 JUR K

3D matter evolution with the Z4 formulation — •Marcus Thierfelder[1], Wolfgang Tichy[2], Sebastiano Bernuzzi[1], Roman Gold[1], David Hilditch[1], and Bernd Brügmann[1] — [1]Theoretisch-Physikalisches Institut, FSU Jena, Germany — [2]Department of Physics, Florida Atlantic University, USA

Several promising tests in spherical symmetry have shown that the evolution with a conformal decomposition of a Z4-like formulation (Z4c) of General Relativity shows advantages in comparison with the BSSNOK formalism. We compare evolutions of both systems in full 3D for puncture and neutron star initial data.

GR 16.3 Do 18:05 JUR K

Phase space of eccentric black hole binaries — •Roman Gold and Bernd Brügmann — Theoretisch Physikalisches Institut, FSU Jena, Germany

The possibility of gravitational wave detections within the near future relies on our understanding of the corresponding sources. Apart from the mere detection there is the additional challenge of how to derive the dynamics of the source from it's observed radiation properties. In terms of a black hole binary it is well-known that parameter estimation becomes much more accurate when the orbits are eccentric. I show recent results on the phase space trajectories as well as radiation properties of two black holes on eccentric orbits computed from fully general relativistic simulations. The data set involves so-called zoom-whirl orbits and hyperbolic encounters. I demonstrate new results on a phase space approach that allows one to qualitatively understand on physical grounds why certain eccentric orbital configurations radiate more intense than others.