GR 11: Numerische Relativitätstheorie II

Zeit: Donnerstag 14:00–15:00 Raum: A214

GR 11.1 Do 14:00 A214

Apparent Horizon Finding — •Norbert Lages — Friedrich-Schiller-Universität Jena, Deutschland

First a brief summary is given of why Apparent Horizons or more generally Marginally Trapped Surfaces (MOTs) are interesting in numerical Relativity.

Special methods are explained for how to find MOTs in axisymmetry and MOTs in arbitrary (conformally flat) spacetimes. I will present a method to extract the eigenvalues of a Newton-type iteration procedure and its possible applications to improve Apparent Horizon finding.

GR 11.2 Do 14:20 A214

Numerical black hole initial data with low eccentricity based on post-Newtonian orbital parameters — Benny Walther, Bernd Brügmann, and •Doreen Müller — Theoretisch-Physikalisches Institut, FSU Jena

We present our implementation of an algorithm for finding initial data for numerical black hole binary simulations resulting in quasi-circular orbits with initial separations of about $10\,M$, where M is the total mass of the two black holes. Our method uses direct parameters from an analytical approach relying on a Hamiltonian formulation with post-Newton approximated Hamiltonian and radiation reaction term. We compare the use of different Hamiltonians and energy fluxes that can be found in the literature and measure the eccentricity of the resulting orbits where a low eccentricity is our measure of success. Our procedure allows us to obtain as low eccentricities as previously achieved with a PN integration procedure for equal mass non-spinning binaries. In addition, we obtain low eccentricities for the unequal mass case and for spinning binaries compared to previously used PN techniques.

GR 11.3 Do 14:40 A214

Finding Event Horizons in Multiple Black Hole Simulations — •Marcus Thierfelder, Bernd Brügmann, and Pablo Galaviz — Theoretical Physics Institute, University of Jena, Germany

We present results of two event horizon finder schemes for full 3D numerical simulations. Both algorithms evolve null surfaces backwards in time. One of them uses a level-set algorithm to describe full 3D event horizons which was first used by Peter Diener. The other is based on a direct 2D parametrisation of the event horizon for simulations with planar symmetry. Both codes can handle numerical spacetimes which are created by the BAM code. We discuss results for the simulation of the inspiral and collision of three black holes.