

Development of a General Relativity Particle-in-Cell code

Compact objects (such as neutron stars or black holes) curve space-time in their surrounding and are the centers for outflowing ionised matter, i.e. relativistic astrophysical jets whose traces are measured by spaceborn detectors in Earth's orbit.

However, to fully understand such jets, a theoretical understanding of such jets in the vicinity of the central mass is needed in addition to measurements.

The idea of this project to combine these two angles and develop a model which simulates the motion of individual particles (constituting relativistic jets) in curved space-time. The project consists of literature study on particle-in-cell methods as well as about numerical schemes in curved space-time as well as an introduction to the General Relativity around compact objects. The goal will be to describe the motion of particles around compact objects including the effect of self-containing electromagnetic fields. Such a code can form the basis for future projects to study the environment of compact objects as well as the emission and properties of relativistic jets.

If we have caught your attention, please contact christoph.koehn@tu-dortmund.de to obtain more information.