GR 12: Classical theory of General Relativity II

Time: Tuesday 15:25–16:05 Location: SPA SR220

GR 12.1 Tue 15:25 SPA SR220

Dynamics of spinning particles in curved geometry — •Daniela Kunst[1], Volker Perlick[1], and Claus Lämmerzahl[1,2] — [1]Center of Applied Space Technology and Microgravity (ZARM), University Bremen, Bremen, Germany — [2]University of Oldenburg, Oldenburg, Germany

Based on a recently developed Hamiltonian approach [1] we consider the dynamics of spinning particles in curved geometry, in particular in Schwarzschild and Kerr spacetime. The chosen framework is linearised in the spin of the particle and uses the Newton-Wigner supplementary condition to close the system of differential equations. When Schwarzschild spacetime is considered in spherical coordinates some peculiar coordinate effects arise which can be eliminated by changing to isotropic coordinates. Thus, when we look at Kerr there is a probability that it inherits these coordinate effects. For this reason, we aim to rewrite the Hamiltonian into the Kerr-Schild cartesian coordinates to compare the results with the ones obtained in Boyer-Lindquist coordinates.

Additionally, we intend to investigate and characterise the dynamics of spinning particles employing methods of KAM and chaos theory. These results can then be compared to studies of such systems with different assumptions, e.g. with other spin supplementary conditions.

[1] E. Barausse, E. Racine, and A. Buonanno, Phys. Rev. D 80, 104025 (2009)

GR 12.2 Tue 15:45 SPA SR220

Thermodynamics of self-gravitating distributions of matter — •Tanja Schlemm, Horst-Heino von Borzeszkowski, and Thoralf Chrobok — Technische Universität Berlin, Berlin, Germany

Relativistic thermodynamics has been applied to self-gravitating spherical distributions of fluid matter, where only reversible processes have been considered. From the condition that no entropy is produced follows that the temperature vector $\xi_\mu = u_\mu/T$ must be Killing or conform Killing.

Applied to exact solutions of static star models given in the literature this approach leads to a mostly homogeneous temperature throughout the star, because the assumed equations of state have no explicit dependence on the temperature. Applied to a time dependent spherical metric and a fluid with heat flux an expanding and a contracting solution were obtained.