

GR 5: Black Holes III

Time: Tuesday 14:45–15:25

Location: HBR 14: HS 2

GR 5.1 Tue 14:45 HBR 14: HS 2

Light propagation in a plasma on Kerr spacetime — •VOLKER PERLICK¹ and OLEG TSUPKO^{1,2} — ¹ZARM, University of Bremen, 281359 Bremen — ²Moscow, Russia

Light propagation in a pressure-free non-magnetised plasma on Kerr spacetime is considered, which is a continuation of our previous study [Phys. Rev. D 95, 104003 (2017)]. It is assumed throughout that the plasma density is of the form that allows for the separability of the Hamilton-Jacobi equation for light rays, i.e., for the existence of a Carter constant. We start with studying spherical orbits, which are contained in a coordinate sphere $r = \mathrm{constant}$, and conical orbits, which are contained in a coordinate cone $\vartheta = \mathrm{constant}$. In particular, it is revealed that in the ergoregion in the presence of a plasma there can exist two different spherical light rays propagating through the same point. We demonstrate that, contrary to the vacuum case, circular orbits can exist off the equatorial plane in the domain of outer communication of a Kerr black hole. Considering the light deflection in the equatorial plane, we derive a new exact formula for the deflection angle which has the advantage of being directly applicable to light rays both inside and outside of the

ergoregion. The possibility of a non-monotonic behavior of the deflection angle as a function of the impact parameter is demonstrated in the presence of a non-homogeneous plasma. We also add some further comments to our discussion of the black-hole shadow which was the main topic of our previous paper. - For details see arXiv:2311.10615.

GR 5.2 Tue 15:05 HBR 14: HS 2

Dynamics of nonlinear scalar field with Robin boundary condition on the Schwarzschild-Anti-de Sitter background — •FILIP FICEK^{1,2} and MACIEJ MALIBORSKI^{1,2} — ¹University of Vienna, Faculty of Mathematics, Oskar-Morgenstern-Platz 1, 1090 Vienna, Austria — ²University of Vienna, Gravitational Physics, Boltzmanngasse 5, 1090 Vienna, Austria

We explore the dynamics of conformal cubic scalar fields on a Schwarzschild-anti-de Sitter background, focusing on the impact of black hole size and Robin boundary conditions. We identify a critical curve in parameter space that demarcates regions with distinct asymptotic behaviours. Key findings include a pitchfork bifurcation of stable solutions in case of the defocusing nonlinearity and existence of thresholds for finite-time blow-ups in the focusing scenario.