

GR 8: Black Holes 1

Time: Wednesday 11:30–12:15

Location: H-HS IX

GR 8.1 Wed 11:30 H-HS IX

A global view on Kerr spacetime – visualizing the maximal analytic extension — •THOMAS REIBER — Universität Hildesheim

The maximal analytic extension of slow Kerr spacetime contains an infinity of asymptotically flat "exterior" regions connected by a strongly curved region. An observer may stay in one of the exterior regions or - crossing event horizons - pass through the strongly curved region to reach one of the other asymptotically flat regions. We calculate videos of what such an observer would see by using general relativistic ray tracing in the maximal analytic extension of Kerr spacetime. For that purpose we use a covering of Kerr spacetime by an atlas consisting of Kerr-Schild and Kruskal-like coordinate patches.

GR 8.2 Wed 11:45 H-HS IX

Aschenbach effect for particles with spin — •VOLKER PERLICK¹, JAFAR KHODAGHOLIZADEH², and ALI VAHEDI³ — ¹ZARM, University of Bremen, 28359 Bremen, Germany — ²Farhangian University, P.O. Box 11876-13311, Tehran, Iran — ³Faculty of Physics, Kharazmi university, P. O. Box 15614, Tehran, Iran

In the Schwarzschild spacetime the orbital velocity of a freely falling particle in circular motion is a monotonically decreasing function of

the radius, as we are used to from Newtonian physics. Therefore, it came as a surprise when in 2004 Bernd Aschenbach realised that in a Kerr spacetime with spin parameter $a^2 > a_c^2$, $a_c \approx 0.9953M$, there is a radius interval close to but outside of the innermost stable circular orbit for which the orbital velocity of co-rotating particles is increasing with the radius coordinate. He showed that this non-monotonic behaviour is related to the presence of a certain resonance that would link the effect to possible observations. Here we investigate how the non-monotonic behaviour of the orbital velocity is modified if particles with spin are considered. To that end we use the Mathisson-Papapetrou-Dixon equation with the Tulczyjew-Dixon and the Frenkel-Mathisson-Pirani supplementary conditions.

GR 8.3 Wed 12:00 H-HS IX

Gravitational lensing in Newman-Unti-Tamburino spacetime — •MOURAD HALLA and VOLKER PERLICK — ZARM Universität Bremen, 28359 Bremen

Gibbons and Werner have shown that in the Schwarzschild and in the Kerr spacetime the deflection angle of light in the equatorial plane is related to the Gauss curvature by the Gauss-Bonnet theorem. Here we generalise this result to the NUT-metric, where the motion of light is not in a plane but in a cone.