2:00-3:00 pm: Dr. Tanja Hinderer (Department of Physics, University of Maryland, USA)

Transient resonances in the inspirals of point particles into black holes

The tow-body problem in the highly relativistic, extreme mass-ration regime has a qualitatively new feature which is not seen for binaries in the weak-field limit: the effects of transient resonances. The resonances occur in generic inspirals of compact objects into spinning black holes when the longitudinal and radial orbital frequencies, which are slowly evolving due to gravitational radiation reaction, become commensurate. At such points, the adiabatic approximation to the orbital evolution breaks down and rapid changes in the orbital parameters can occur. These give rise to corrections to the gravitational wave signal´s phase that scale as the square root of the inverse of mass ration and could become large ine the extreme mass-ration limit, dominating over all other post-adiabatic effects. In this talk I will discuss the properties and effects of transient resonances and the observational implications.

3:00-4:00 pm: Dr. Eva Höne (Center of applied Space Technology and Microgravity, ZARM)

Motion of test particles in a regular black hole space–time

We consinder the motion of test particles in the regular black hole space-time given by Ayon-Beato and Garcia (Phys. Rev. Lett. 1998) as solution of the Einstein equation coupled to a nonlinear electrodynamics. The complete set of orbits for neutral and weakly charged test particles is discussed, including for neutral particles the extreme and over-extreme metric. We also derive the analytical solutions for the equation of motion of neutral test particles in parametric form.

4:30-5:30 pm: Prof. Dr. Heino Falcke (Radboud University, Nijmegen & ASTRON Dwingeloo, NL)

Towards Imaging the Black Hole Event Horizon in the Galactic Center

More than 40 years ago the first quasars were discovered in the most distant parts of our universe, making them the most luminous objects we know. It was then a big mystery how a source of the size of the solar system could possibly produce as much light as one trillion stars. Very quickly supermassive black holes at the centers of galaxies became the main suspects for explaining these strange objects. Black holes are theoretical predictions of Einstein's General Theory of Relativity, where large amounts of matter are concentrated so much that even light cannot escape its gravitational attraction. Thus, black holes mark singularities in space and time, which are surrounded by an event horizon that allows matter and light to go inwards but never go out again. However, do these supermassive black holes and their event horizons really exist? The best place to look is in the center of our own Milky Way. Here a compact radio source with a mass of 4 Million times the mass of the sun, seems to mark the central black hole of our Galaxy, providing by the far the best evidence for the existence of black holes in general. Radio observations are now probing the smallest scales of this object, eventually making it possible to even image the elusive event horizon of a black hole for the very first time.