GR 12: Gravitational Waves

Time: Wednesday 17:10–18:10 Location: H 2013

GR 12.1 Wed 17:10 H 2013

LISA Pathfinder — •Martin Hewitson — Max-Planck-Institut für Gravitationsphysik und Universitaet Hannover Callinstr. 38, 30167 Hannover, Germany

LISA Pathfinder (LPF) is a precursor and technology validation mission for LISA-like Gravitational Wave Observatories in space. Some of the key technology needed for these observatories, such as micro-Newton propulsion, space-based optical metrology, drag-free control, and inertial sensing, will be directly tested on LPF. With a scheduled launch date of July 2015, the mission is at an advanced stage of integration and testing, and the training and preparation for science operations is well underway. This talk will give an overview of the overall mission, giving the status of the various key components, a discussion on the key noise sources, and a brief introduction to the experiments and activities of the science operations phase.

GR 12.2 Wed 17:30 H 2013

Prospects for Joint Gravitational-Wave and Electromagnetic Observations of Neutron-Star/Black-Hole Coalescing Binaries — •Frank Ohme and Francesco Pannarale — Cardiff University, United Kingdom

Coalescing neutron star black hole (NS-BH) binaries are a promising source of gravitational-wave (GW) signals detectable with large-scale laser interferometers such as Advanced LIGO and Virgo. These systems are also one of the main progenitor candidates for short gamma-ray bursts (SGRBs). Detecting an NS-BH coalescence both in the GW and the electromagnetic (EM) spectrum offers a wealth of information about the source. How much can actually be inferred from a joint detection is unclear, however, as the accuracy of the GW measurement can be reduced by the presence of a mass/spin degeneracy. In order to shed light on this problem, we combine recent semi-analytical predictions for the post-merger remnant disc mass with estimates of the parameter-space portion that is selected by a GW detection. By varying the model for the currently unknown NS equation of state (EOS), we identify cases in which an SGRB ignition is assured, others in which it can be excluded, and finally others in which the outcome depends on the EOS. We pinpoint a range of systems that would allow us to place lower bounds on the EOS stiffness if both the GW and EM emission are observed. The methods we develop can broaden the scope of existing GW detection and parameter-estimation algorithms, and they extend our understanding of the potential of joint EM+GW observations.

GR 12.3 Wed 17:50 H 2013

Isofrequency Pairing of spinning particles in Schwarzschild-de-Sitter Spacetime — •Daniela Kunst[1], Volker Perlick[1], and Claus Lämmerzahl[1,2] — [1]ZARM, Universität Bremen, Bremen — [2]Universität Oldenburg, Oldenburg

Einstein's theory of general relativity leads to the prediction of gravitational waves, i.e. oscillations in the gravitational field propagating at the speed of light. One observable feature is the frequency of a gravitational wave. These frequencies can be related to the fundamental ones of the dynamical system representing the source. It was long thought that the frequencies describe the state of a conservative dynamical system uniquely and therefore offer clear information on the underlying source. However, it has been shown that the system of a testparticle moving around a Schwarzschild or Kerr black hole contains states with degenerate frequencies. Thus, having the frequencies is not sufficient to make a distinct deduction on the state of the dynamical system evoking obstacles for the scientiests who are interpreting gravitational wave signals.

In order to make the system more astrophysically relevant we investigate the system of a spinning particle moving in a Schwarzschild geometry with a positive cosmological constant.