GR 4: Gravitational waves II

Zeit: Dienstag 16:30–18:10 Raum: Phys-SR-SE1

GR 4.1 Di 16:30 Phys-SR-SE1

Waveform modeling for gravitational wave astronomy — •Harald Pfeiffer — Max Planck Institute for Gravitational Physics (Albert Einstein Institute)

The past two years have witnessed the advent of gravitational wave (GW) astronomy led by the spectacular observations of binary black holes and binary neutron stars by the LIGO and Virgo detectors. GW astronomy relies on knowledge of the gravitational waveforms for a variety of tasks: To design search strategies to detect gravitational waves; to measure masses, spins and tidal parameters of the coalescing compact objects; and also to test general relativity and to search for signatures of physics beyond classical general relativity.

This talk elucidates the interplay between GW astronomy and waveform modeling. We will present new waveform models, and will discuss validation studies to ensure that the recent GW observations are not biased by waveform model deficiencies. Particular emphasis will be paid to numerical relativity simulations, the only means to compute the gravitational waves emitted during the genuinely nonlinear and dynamic late inspiral and merger phase of compact object binaries.

GR 4.2 Di 16:50 Phys-SR-SE1

Enhancing the Optical Spring in Gravitational-Wave Detectors via Intra-Cavity Optical-Parametric Amplification — •Mikhail Korobko[1], Farid Ya. Khalili[2,3], and Roman Schnabel[1] — [1]Institut für Laserphysik und Zentrum für Optische Quantentechnologien, Universität Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany — [2]Moscow State University, Department of Physics, Moscow 119992, Russia — [3]Russian Quantum Center, Skolkovo 143025, Russia

Over the past two years Advanced LIGO and Advanced Virgo gravitational wave detectors have made several observations of gravitational waves from merging binary black holes and binary neutron stars. Extending the detection range and increasing the number of events requires a higher sensitivity of the detectors, that is mainly limited by the quantum radiation pressure and shot noise in the current design. One of the ways to improve the sensitivity is to use the optical spring effect, where detuning the optical cavity from its resonance causes the electromagnetic fluctuations to create a position-dependent force on the detector mirrors. This additional force gives a rise to a resonant enhancement in sensitivity for some gravitational wave frequency. We investigate the use of an optical parametric amplification to enhance this effect. We discuss how the frequency of this resonance can be tuned dynamically, matching the signal frequency of a signal, thus achieving a significant and broadband enhancement in sensitivity. We show that this all-optical control of the optical spring can be a versatile way of shaping the sensitivity in future gravitational-wave detectors.

GR 4.3 Di 17:10 Phys-SR-SE1

Signatures of alternative models of gravity in the gravitational waves: the quasi-normal modes of compact objects — •Jose Luis Blazquez-Salcedo — University of Oldenburg, Oldenburg, Germany

We study the ring-down phase of gravitational waves emitted from compact objects, such as neutron stars and black holes. We consider alternative models of gravity, e.g., Einstein-Gauss-Bonnet-dilaton theory, Scalar-Tensor theory, etc. The properties of the ring-down of these objects are studied using the quasi-normal mode formalism. This allow us to calculate how the theory characterises the properties of the ring-down in each case. We compare with the standard General Relativity results, which give us possible signatures of the alternative models of gravity in the gravitational wave emission.

GR 4.4 Di 17:30 Phys-SR-SE1

Astrophysical Gravitational Waves in Conformal Gravity — •Patric Hölscher[1], Chiara Caprini[2], and Dominik Schwarz[1] — [1]Bielefeld University, Germany — [2]Laboratoire Astroparticule et Cosmologie, Paris, France

We investigate gravitational radiation from binary systems in Conformal Gravity (CG) and Massive Conformal Gravity (MCG). These theories have achieved interesting results, like fitting galaxy rotation curves without dark matter.

For the linearised theory it turns out that the metric is given by the sum of a massless and a massive spin-2 field. Calculating the decay of the orbital period of binary systems for different mass regimes, our results show that CG and MCG with a small mass for the massive spin-2 field cannot explain the decay of the orbital period via gravitational radiation. But for MCG in the case of a large mass, the decrease of the orbital period is in agreement with current data. Additionally, this theory seems very interesting since it has a correct limit to General Relativity and is renormalizable.

GR 4.5 Di 17:50 Phys-SR-SE1

A new interpretation of Gravitational Waves — •Norbert Sadler — Norbert Sadler ;Wasserburger Str. 25a; 85540 Haar

It can be shown that the Gravitational Waves result from a local linear, longitudinal, energy-desity oscillation between the middle energy-density of the universe,from 4/9 proton energy equivalence per one meter and the proton radius.

At fusion of two Black-Holes as well as two Neutron-Stars the Exceptional E8 Symmetry Group, especially the 57 dimensional object and the space structure will be stimulated and extended along the directional density oscillation.

The E8-Symmetry Group replaces the Spacetime!

The plain gravity channel-waves can be shown as real wave functions of the gravitative and the electromagnetic interactions as well of the Hubble-Vortex.

2*Pi*alfa(Gravitation)=alfa(QED)*(Ho X Ho).

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