GR 11: Gravitational Waves and Astrophysics II

Time: Thursday 11:00–12:30 Location: ZEU/0260

Invited Talk GR 11.1 Thu 11:00 ZEU/0260

From quarks to black holes: micro- and macrophysics of neutron star mergers — •Andreas Bauswein — GSI Helmholtzzentrum fuer Schwerionenforschung, Darmstadt, Germany

Neutron stars are the densest stellar objects with densities exceeding those in atomic nuclei. Consequently, the collision of two neutron stars creates very extreme conditions and leads to a variety of different highly energetic and potentially observable phenomena: electromagnetic radiation from radio to gamma wavelengths, neutrinos and gravitational waves. Since the first unambiguous observation of a neutron star merger in 2017, a few more events have been detected, and increased instrumental sensitivity promises many more measurements in the future. We will provide an overview on which fundamental questions can be addressed by studying neutron star mergers. This includes the formation of black holes or the synthesis of heavy elements in the explosive outflows from these events. Moreover, mergers provide information on the properties of high-density matter including the prospect to identify the presence of a possible phase of deconfined quark matter in neutron stars.

Invited Talk GR 11.2 Thu 11:45 ZEU/0260

Tracing beyond GR physics with gravitational waves — •Daniela Doneva — Theoretical Astrophysics, University of Tübingen, 72076 Tübingen, Germany

Gravitational waves are among the ultimate tools to test fundamental physics and promise to answer the long-waiting question about the nature of gravity in the regime of strong fields. The degeneracies between different effects are a serious obstacle, though, to fulfilling this goal since modified gravity often leads to smaller cumulative changes. In the present talk we will focus on a few examples of interesting new effects we can observe in the gravitational wave spectrum that differ qualitatively from the standard picture in general relativity. This includes gravitational phase transition of neutron stars, jumps in the gravitational wave emission from merging black holes, and inverse chirp signal of extreme mass-ratio inspirals. Such effects are valuable because they are a smoking gun of beyond-GR physics that can be easily traced in observations.