# GR 4: Other Topics in Gravitational Physics

Time: Monday 17:15–18:00 Location: H-HS IX

GR 4.1 Mon 17:15 H-HS IX

**Probabilistic framework for the gravitational clock compass** — •Dirk Puetzfeld — ZARM, Uni Bremen

We present a probabilistic description of the gravitational clock compass which allows for a hierarchical determination of the gravitational field as well as a transparent modeling of all errors involved in the measurement process.

GR 4.2 Mon 17:30 H-HS IX

**Rogue waves in a selfgravitating BEC** — •Sandro Gödtel and Claus Lämmerzahl — ZARM, University of Bremen, Germany

The coupling between gravity and quantum mechanics is still an open question in physics. As an example, we explore self-gravitational effects within a Bose-Einstein condensate. Such a system is described by the Gross-Pitaevskii-Newton equation which was first introduced as a concept of boson stars. The nonlinearity of the particle interaction causes special phenomena like rogue waves. Originally observed in ocean waves these waves are able to increase the density locally. For a mathematical description we use the common model called the Peregrine soliton. In our work, we show that these solutions indeed exist in a BEC and estimate the size of these waves with typical experimental values. Additionally, we determine the gravitational impact on the condensate due to the higher density and we show at which values the gravitational self-interaction becomes significant and observable.

GR 4.3 Mon 17:45 H-HS IX

**Accretion processes around boson stars** — •Matheus do Carmo Teodoro[1], Jutta Kunz[1], and Lucas Collodel[2] — [1]Oldenburg universität — [2]Tübingen universität

In this work we studied the behavior of ideal gas clouds near boson stars (BS). Being the later described by a complex field scalar theory coupled to general relativity, BS can have a wide set of configuration, ranging from very compact objects to extremely extensive ones, with masses that go from atomic scale to the order of supermassive black-holes. For this reason they are also candidates for Black Hole Mimickers and of particular astrophysical interest. On the other hand, these objects possess no hard surface nor event horizon, meaning that matter could pass through them. Tidal disruption events on these spacetimes would have then a peculiar nature. In order to approach this topic we have performed, using state-of-the-art numerical techniques accomplished by the Black Hole Accretion Code (BHAC), 2D fully relativistic simulations taking as initial condition spherical clouds at rest with a Gaussian distribution of density in hydrodynamic equilibrium with the atmosphere. Aiming to discuss the differences of such events around boson stars and black holes, we shall present the results from our simulations in this talk.