GR 18: Gravitationswellen

Zeit: Freitag 9:10–10:30 Raum: ZHG 002

GR 18.1 Fr 9:10 ZHG 002

Time-Delay Interferometry and clock noise removal for LISA — •Markus Otto — Centre for Gravitational Physics Hannover and QUEST, Callinstraße 38, 30167 Hannover

Laser phase noise is the dominant noise source in the on-board measurements of the space-based gravitational wave detector LISA. Time-Delay Interferometry (TDI) provides synthesized data streams free of laser phase noise while preserving the gravitational wave signal. At the same time TDI also removes fluctuations of the on-board clocks that distort the sampling process. TDI needs precise information about the spacecraft separations, sampling times and differential clock noise between the three spacecraft. These are measured using auxiliary modulations on the laser light.

In our talk, we will discuss a compliant algorithm that corrects for both clock and laser noise in the case of a rotating, non-breathing LISA constellation. Furthermore, we will consider the absolute order of laser frequencies forming the beatnote at the photodetectors. As an outlook, we will shortly discuss an optical setup to verify the TDI algorithm in the experiment.

GR 18.2 Fr 9:30 ZHG 002

eLISA / NGO – ein Gravitationswellendetektor im All — •Peter Aufmuth — Max-Planck-Institut für Gravitationsphysik (Albert-Einstein-Institut), Callinstr. 38, 30167 Hannover.

In ihrem 2010 veröffentlichten Zehnjahresprogramm hat das Board on Physics and Astronomy den Nachweis von Gravitationswellen durch die Weltraummission LISA („Laser Interferometer Space Antenna“) zu einem der wichtigsten astrophysikalischen Projekte der nächsten Dekade erklärt. Ursprünglich gemeinsam von ESA und NASA geplant, mußte sich die NASA Anfang 2011 aus finanziellen Gründen aus der Vorbereitung von LISA zurückziehen. Die Mission soll nun unter dem Namen eLISA / NGO („evolved LISA / New Gravitational wave Observatory“) von der ESA allein durchgeführt werden. Durch eine Reskalierung des ursprünglichen Konzepts werden Kosten eingespart ohne den wissenschaftlichen Nutzen der Mission wesentlich zu verringern. In dieser Form gehört eLISA / NGO zu den Missionen der L-Klasse der ESA („Cosmic Vision 2015 – 2025“), deren Start für Anfang der 2020er Jahre vorgesehen ist.

GR 18.3 Fr 9:50 ZHG 002

Maximum elastic deformations of relativistic stars — •Nathan K. Johnson-McDaniel[1,2] and Benjamin J. Owen[2] — [1]Theoretisch-Physikalisches Institut, Friedrich-Schiller-Universität, Jena, Deutschland — [2]Institute for Gravitation and the Cosmos, Center for Particle and Gravitational Astrophysics, The Pennsylvania State University, University Park, PA, USA

Deformed neutron stars are a prominent potential source of gravitational waves, and there are active searches for these waves by the LIGO/Virgo collaboration. It is thus of considerable interest to know the maximum deformation that could be obtained for various models of neutron stars. We present here the first general relativistic calculations of such maximum quadrupoles in the case of elastic deformations. We consider the standard case of the quadrupoles generated by crustal deformations, and the somewhat more speculative case of quadrupoles generated by deformations of the hadron-quark mixed phase in hybrid stars, where we use our recent calculation of the shear modulus. In both cases, we find relativistic suppressions of the maximum quadrupole, compared with the standard, Newtonian calculations; these suppressions can be as large as a factor of 6 for the crustal quadrupoles of massive, compact stars. But even with the suppressions, maximally strained hybrid stars can still sustain quadrupoles large enough that they could have been detected in recent LIGO/Virgo searches (assuming that the large breaking strain recently calculated for the crust is applicable to the mixed phase in the core).

GR 18.4 Fr 10:10 ZHG 002

Mind the resonances — •Georgios Lukes-Gerakopoulos for the Pierre Auger-Collaboration — Theoretical Physics Institute, University of Jena, 07743 Jena, Germany

Though, the ergodic motion is the most prominent effect of a non-integrable system, the frequency spectrum of the ergodic motion corresponds to noise. However, the resonances of the intrinsic frequencies of a non-integrable system produces interesting non-linear phenomena which could be detected during a gravitational wave analysis. I will present these resonance phenomena for different types of "bumpy" black holes and I will indicate how these phenomena can be observed.