



RTG Models of Gravity Colloquium

Date:	06.05.2019
Time:	11:00 - 17:15
Location:	University of Bielefeld Room X-E0-200

Program

11:00 - 12:00	Students' Seminar: Nitesh Bhardwaj (Bielefeld) <i>"Cosmology with LoTSS: The angular two-point correlation function"</i>
12:00 - 12:15	Discussion and Coffee
12:15 - 12:45	Journals' Club: Bilel Ben Salem (Bielefeld) <i>"A brief introduction to pulsar timing"</i>
12:45 - 14:15	Lunch and board meeting "Nordlicht", X-Building
14:15 - 15:15	Talk 1: Laura Tolos (Frankfurt) <i>"A new family of compact objects: Dark Compact Stars"</i>
15:15 - 15:45	Discussion and Coffee
15:45 - 16:45	Talk 2: Michael Janssen (Nijmegen) <i>"The first image of a black hole"</i>
16:45 - 17:15	Discussion and Coffee
18:30	Dinner

Abstracts

Talk 1:

Laura Tolos (Frankfurt)

"A new family of compact objects: Dark Compact Stars"

A new family of compact objects formed by dark matter admixed with neutron star matter and white dwarf material is investigated. We consider non-self annihilating dark matter with an equation-of-state given by an interacting Fermi gas with particle masses in the range of 1-500GeV. We obtain new stable solutions, dark compact stars. For weakly interacting dark matter, the dark compact stars have Earth-like masses and radii from few Km to few hundred Km, whereas they have Jupiter-like masses and radii of few hundred Km for the strongly interacting dark matter case. We find that the total mass of the dark compact stars increases with decreasing dark matter particle mass. Moreover, we observe that the smaller the dark matter particle mass, the larger the quantity of dark matter captured is, putting constraints on the dark matter mass trapped in the compact objects so as to fulfill 2M sun observations. We also discuss how these dark compact stars can be observed as exoplanets as well as their formation in an homogeneous and non-homogeneous dark matter environment.

Talk 2:

Michael Jansen (Nijmegen)

"The first image of a black hole"

The Event Horizon Telescope (EHT) is a global VLBI array with the capability to study millimetre wave emission from extragalactic radio sources with an unprecedented micro-arcsecond resolution. In a 2017 observing run, the EHT observed the centers of the M87 galaxy and our own milkyway Sagittarius A*, recording ~4 petabyte of data. A first result from this observing session has been revealed on 10 April 2019 in six simultaneous press conferences around the world: The first image of a black hole. The observed image shows a bright emission ring, which is consistent with expectations for the shadow of a Kerr black hole as predicted by general relativity. We have resolved an asymmetry in the brightness of the ring, which can be explained in terms of relativistic beaming of the emission from plasma rotating close to the speed of light around a black hole. I will present comparisons of the EHT M87 data to geometric and ray-traced general relativistic magnetohydrodynamic models and show how we are able to measure the M87 central black hole mass to be 6.5 billion solar masses. Furthermore, I will predict how upcoming EHT observations are able to put tighter constraints on theoretical models and how we may be able to obtain extremely sharp event horizon images with future space VLBI missions.

Journals' Club

Bilel Ben Salem (Bielefeld)

"A brief introduction to pulsar timing"

Pulsars are very fascinating objects to study. These rapidly rotating, highly magnetised neutron stars produce radio beams that sweep the sky like a lighthouse. Due to their stable spins they could be used as highly accurate clocks distributed all over the galaxy. In my talk I will introduce the basic technique of pulsar timing and review the results from timing of the relativistic pulsar-white dwarf binary PSR J1738+0333 which provides the most stringent test of scalar-tensor gravity.

Students' Seminar

Nitesh Bhardwaj (Bielefeld)

"Cosmology with LoTSS: The angular two-point correlation function"

In this seminar I will talk about a preliminary analysis of the LOFAR Two-metre Sky Survey (LoTSS) data. This will include a description of the science goals and the statistical tests employed to assess the data, especially the angular two-point correlation function.