CARL VON OSSIETZKY universität OLDENBURG
FAKULTÄT V
MATHEMATIK UND NATURWISSENSCHAFTEN

Institut für Physik

Theoriekolloquium

Am **24. Mai 2018** um **14.15 Uhr** in **W2 1-143** hält

Herr Dr. Ziri Younsi (Frankfurt)

einen Vortrag mit dem Titel

Shadows, Accretion and Outflows: Understanding the Emissions from Black Holes

It is now widely-believed that Active Galactic Nuclei (AGN) are powered at their cores by supermassive black holes (SMBHs). The prodigious outflows from these systems, most commonly manifesting as large-scale relativistic jets, e.g. M87, are driven by accretion onto the SMBH from its host environment. There are also lower-luminosity AGN, in particular our Galactic Centre BH candidate Sgr A*, which although being significantly less luminous than many of its feeding cousins, provides an ideal testbed for BH science, in particular for studying the near-environment of black holes, from the accretion flow all the way down to the event horizon-scale. However, the issue as to whether astrophysical black holes actually exist is by no means a closed matter.

Recent technological advancements in very-long-baseline-interferometry (VLBI) have enabled astrophysical sources, in particular Sgr A* and M87, to be imaged on angular scales of a few micro-arseconds, thereby providing the potential to resolve the event horizon. Indeed, recent observations of Sgr A* with the Event Horizon Telescope (EHT) have revealed structure on horizon-scales. The detection and measurement of the back hole "shadow" is expected to enable the existence of astrophysical black holes to be verified directly. Whilst in theory the mathematical description of this shadow is straightforward, in reality its observational appearance is strongly-dependent on the (thermo)dynamics of the surrounding accretion flow, which on event horizon-scales is highly turbulent.

In this talk I will begin with an overview of the motivation and observational efforts regarding resolving the Galactic Centre region and Sgr A*. Next, I will discuss some of our recent theoretical efforts within the BlackHoleCam and EHT collaborations to model the black hole shadow and the electromagnetic emissions emanating from the surrounding accretion flow. By exploiting recent developments in numerical simulations of general-relativistic (GR) magnetohydrodynamics (MHD) and polarised GR radiation-transport (GRRT), we can now model very accurately the observed emission from accreting SMBHs, providing a foundation on which to both compare with and interpret astronomical observations and understand the physical properties of the black hole and its environment.

Furthermore, whilst it is anticipated that Sgr A* is a spinning Kerr BH, other BH solutions exist, both within GR and in alternative theories of gravity, which cannot presently be ruled out. I will also present recent results from GRRT calculations of GRMHD simulations in such alternative theories, with the aim of helping interpret upcoming observations of Sgr A*, testing the Kerr BH hypothesis and potentially excluding (or at least constraining) other BH solutions and theories of gravity.

Interessierte sind herzlich eingeladen.

gez. Prof. Dr. Claus Lämmerzahl