Research Training Group
Graduiertenkolleg
Models of Gravity

RTG Colloquium Models of Gravity	
Date:	14 July 2021
Time:	09:00 - 11:30 CET
Location:	Bielefeld University/online Zoom-Link: https://uni-bielefeld.zoom.us/j/92673696258?pwd=cXhNZTJDZHlGeGo5dGNVNitrVUxDUT09 Meeting-ID: 926 7369 6258

Programme

09:00 – 10:00 Talk 1: **Sebastian von Hausegger** (University of Oxford)
"Testing the Cosmological Principle with Distant Galaxies"

Abstract:
In the first part of this talk I will discuss the Cosmological Principle — the assumption that our universe is homogeneous and isotropic on large scales — and its central role in standard analyses in cosmology. Various tests can be devised to examine the validity of the Cosmological Principle in probes of Large Scale Structure. I will then focus on one such test, that we conducted on a large, full-sky, flux-limited sample of high-redshift galaxies, 1.36 million quasars observed by the WISE satellite, which reveals inconsistency with the Cosmological Principle at 4.9σ — the highest significance of any such finding to-date. I will discuss consequences of this result and comment on possible avenues for future research.

10:00 – 10:30 Break:

We will meet in Zoom breakout rooms

Research Training Group
Graduiertenkolleg
Models of Gravity

Programme

10:30 – 11:30 Talk 2: **Siyuan Chen** (CNRS, Orléans)
"From Pulsars to Supermassive Black Holes and Gravitational Waves inbetween"

Abstract:
Pulsar Timing Arrays (PTAs) aim to detect nHz gravitational waves (GWs) by looking for correlated variations of the Times of Arrivals (TOAs) across an array of ultra-stablemillisecond pulsars. Comparing the predicted TOAs from our timing model against the measured TOAs gives us the residuals. These contain the imprint of GWs, but also other effects and sources of noise processes. A gravitational wave background (GWB) manifests as a common spatially correlated process across all pulsars, with thecharacteristic signature being the Hellings-Downs correlation - the smoking gun of the detection of a GWB. One possible source for such a GWB could come a population of merging supermassive black hole binaries (SMBHBs). Three established PTA collaborations: the North American Nanohertz Gravitational Wave Observatory
(NANOGrav), the Australian Parkes PTA (PPTA) and the European PTA (EPTA), as well as emerging PTA collaborations from India, China and South Africa all work together in the International PTA (IPTA) consortium towards the common goal of detecting low frequency GWs.
Recently, PTAs have reported the detection of an uncorrelated but spectrally similar signal found amongst a number of pulsars in the array. However, due to the lack of significant evidence for the Hellings-Downs correlation, the signal cannot be confirmed to be a GWB yet. I will present results from the analyses of the most recent datasets of the three PTAs as well as the IPTA data release 2. We find consistent amplitudes across all 4 datasets for this signal and hope to confirm its origin in a future data combination with the IPTA. If this signal is indeed a GWB, it canbe interpreted as coming from numerous different astrophysical sources. I will focus on the astrophysical interpretation of such a speculative detection using SMBHBs from galaxy mergers.