data@breakfast webinar series

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Prof Yin-Zhe Ma & Dr Wei-Ming Dai
University of KwaZulu-Natal

Friday, 19 February 2021 Time: 07h30 - 08h30

The puzzle of Hubble constant: a holographic Universe solution

Abstract: Cosmology has entered a golden era of precision measurement for almost two decades. The parameters of the Universe are constrained with higher and higher precision with more advanced astronomical data. However, the Hubble constant, one of the most fundamental parameter of the Universe, has different values measured by different experiments. The measurement from the cosmic microwave background radiation and the baryon acoustic oscillation surveys give a low-value H_0=67 km/s/Mpc which is much lower than the local measurements from distance ladder measurements (74 km/s/Mpc). Is this because some measurement is wrong? Or is this because of unknown (new) physics? We will review the current status of measurements from various surveys, and propose a physical and provable (falsifiable) solution to this problem. We describe the vacuum energy in a cosmic IR region whose total energy saturates the limit of collapsing into a black hole as the "holographic dark energy". We calculate its equation of the state evolution and predict the background cosmology behaviour. We find that the model can reconcile the discrepancy between the high-redshifts and local measurements of H0 for almost all current data sets, thus provide a viable solution to the puzzle. We further discuss how we can distinguish this model with others with future CMB and large-scale structure surveys.

Bio: **Prof. Yin-Zhe Ma** is an associate professor at the University of KwaZulu-Natal. He obtained his PhD from the University of Cambridge in 2011, then conducted postdoctoral researches at the University of British Columbia and the University of Manchester before joining UKZN. His research focuses on observational and theoretical cosmology aimed at understanding the fundamental laws of the Universe and uncovering the nature of dark energy and dark matter. In particular, he works on Epoch of Reionization, 21-cm Intensity mapping, and cosmic microwave background radiation. He is currently a member of the Hydrogen Epoch of Reionization Team (HERA), several working groups of the Square Kilometer Array (SKA) team, the Planck science team, and the TAIPAN/6dFGS galaxy survey team.

Dr. Wei-Ming Dai is a postdoc at the University of KwaZulu-Natal. He obtained his Ph.D. from the Institute of Theoretical Physics, Chinese Academy of Sciences in 2018 and has since worked with professor Yin-Zhe Ma at UKZN. His research interests include 21-cm intensity mapping, cosmic microwave background radiation, neutrino cosmology, large-scale structure, and data analysis.

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