

## GR 7: Cosmology

Zeit: Mittwoch 16:45–19:05

Raum: VMP6 HS A

**Hauptvortrag** GR 7.1 Mi 16:45 VMP6 HS A**Back in the saddle: Large-deviation statistics of the cosmic log-density field** — ●CORR UHLEMANN — 1 Institute for Theoretical Physics & Center for Extreme Matter and Emergent Phenomena, Utrecht University, Leuvenlaan 4, 3584 CE Utrecht, The Netherlands

We present a first principle approach to obtain analytical predictions for spherically-averaged cosmic densities in the mildly non-linear regime that go well beyond what is usually achieved by standard perturbation theory. A large deviation principle allows us to compute the leading-order cumulants of average densities in concentric cells. In this symmetry, the spherical collapse model leads to cumulant generating functions that are robust for finite variances and free of critical points when logarithmic density transformations are implemented. Hence, they yield accurate density probability distribution functions (PDFs) from a straightforward saddle-point approximation valid for all density values. Based on this easy-to-implement modification, explicit analytic formulas for the evaluation of the one- and two-cell PDF are provided. The theoretical predictions obtained for the PDFs are accurate to a few percent compared to the numerical integration, regardless of the density under consideration and in excellent agreement with N-body simulations for a wide range of densities. This formalism should prove valuable for accurately probing the quasi-linear scales of low redshift surveys for arbitrary primordial power spectra. The large deviation principle exemplified here extends far beyond this concrete application and can be invoked for any cosmological quantities taken in concentric cells.

GR 7.2 Mi 17:25 VMP6 HS A

**Cosmology with the Square Kilometre Array and its Pathfinders** — ●DOMINIK SCHWARZ — Universität Bielefeld

Observations at radio frequencies played a crucial role in establishing the isotropy and vast size of the Universe in the early days of our modern cosmological model. With the discovery of the cosmic microwave background, radio observations had to step back. With the development of a new generation of radio facilities like LOFAR and the SKA, which allow for all-sky, sensitive and fast surveys, there are now new windows of opportunity for game changing cosmological observations in radio, especially via HI observations. I'll focus in my talk on how those observations will be unique cosmological probes.

GR 7.3 Mi 17:45 VMP6 HS A

**Models of reionization and dark matter decay** — ●ISABEL OLD-ENGOTT, DANIEL BORIERO, and DOMINIK SCHWARZ — Universität Bielefeld

We investigate two different parametrizations of cosmic reionization and their impact on the CMB anisotropy spectrum. We furthermore include an additional source of reionization which we assume to be the decay of a dark matter species and which can in principle modify the ionization history of the universe already at relatively high redshifts. Given the uncertainties of cosmic reionization we want to understand

how reliably we can constrain dark matter quantities like the decay rate.

GR 7.4 Mi 18:05 VMP6 HS A

**Galactic center analysis with Fermi LAT Pass 8 data and limits on dark matter annihilation** — ●DMITRY MALYSHEV for the Fermi LAT-Collaboration — ECAP, Erwin-Rommel str. 1, Erlangen, Germany

We study the excess emission around a few GeV towards the Galactic center (GC) with Pass 8 Fermi-LAT data and estimate the uncertainty of its spectrum due to diffuse emission modelling. In particular, we test several GALPROP models of Galactic diffuse emission, develop an alternative distribution of gas along the line of sight based on starlight extinction data, model the Fermi bubbles at low latitudes, and test additional sources of cosmic ray electrons near the GC. We find that in all models that we have tested the excess emission persists. As an alternative approach to estimate the uncertainty due to diffuse emission modelling we perform a scan of a cusp template along the Galactic plane. We find that the excess emission as a fraction of the background is comparable to the uncertainties found elsewhere in the Galactic plane. We put limits on DM annihilation assuming that DM particles cannot produce a signal that exceeds the uncertainties due to diffuse emission modelling.

GR 7.5 Mi 18:25 VMP6 HS A

**Dark Energy Is Obsolete in Einstein-Dicke Cosmology** — ●ALEXANDER UNZICKER — Pestalozzi-Gymnasium München

Einstein's very first idea when dealing with general relativity was considering a variable speed of light in 1911. As it is little known, Robert Dicke in 1957 constructed an almost equivalent theory of gravity that is in agreement with all classical tests. However, Dicke's model leads to a different cosmology in which the redshift of distant galaxies is caused by a decrease of the speed of light.

Since there is no expansion of matter, just the spreading of light, no slowdown of the expansion due to gravity is expected. This absence of deceleration is precisely the anomaly (sometimes called 'empty universe' model of supernova data) that is usually interpreted as accelerated expansion, caused by a hypothetical substance called dark energy. In Dicke's model, there is no need for dark energy, because the expansion of the universe itself is an illusion, originating from a decrease of the speed of light over cosmological times.

GR 7.6 Mi 18:45 VMP6 HS A

**Weltpotentialtheorie (WPT) mit stabil statischer Kosmologie** — ●PETER WOLFF — Calfreisen

Zur WPT gibt es im Netz eine Leseempfehlung: [www.wolff.ch/astro/WPT-Lesetipp.pdf](http://www.wolff.ch/astro/WPT-Lesetipp.pdf)

Bei genügendem Interesse werde ich die Kernpunkte der WPT in einem Kurzvortrag vorstellen.