GR 8: Kosmologie

Zeit: Donnerstag 8:30–10:30 Raum: 30.45: 101

GR 8.1 Do 8:30 30.45: 101

Angular Size Test for Galaxies at Low Redshift with SDSS — •Alexander Unzicker[1] and Karl Fabian[2] — [1]Pestalozzi-Gymnasium München — [2]Geological Survey of Norway, Trondheim

Based on magnitudes and Petrosian radii from the Sloan Digital Sky Survey (DR 7) at low redhift (z <0.2), we perform a test of galaxy size evolution. Since size is obviously correlated to absolute magnitude, the analysis critically depends on the appropriate selection. Several possible artifacts are considered: the Malmquist bias is excluded by using volume-limited samples, and a correction for seeing is applied. We tested also different K-corrections and determined the dependence on the Hubble constant and on other cosmological parameters. We noted a slight increase of average galaxy size with time which is stable across a wide range of luminosities. However, taking into account to the recently discovered luminosity evolution with redshift, the effect is almost reversed. This result raises some questions whether the standard view of galaxy evolution is supported by observations. To facilitate further investigations, the Mathematica code and instructions for data download are publicly available.

GR 8.2 Do 8:50 30.45: 101

Geodesic motion of test particles in the space-time of cosmic (super)strings — •Parinya Sirimachan and Betti Hartmann — School of Engineering and Science, Jacobs University Bremen, 28759 Bremen

In this talk I will discuss test particle motion in the space-time of an Abelian-Higgs string and in comparison to that in the space-time of a (p,q)-string, which is a cosmic superstring consisting of p D-strings and q F-strings. The string solutions are solutions to Abelian-Higgs models coupled minimally to gravity and can only be given numerically. The solutions to the geodesic equation can hence also only be given numerically and can be classified according to the test particle's energy, angular momentum and momentum in the direction of the string axis. We find that massive test particles can be attracted and form bound orbits when they are very close to the core of the strings. In the case of Abelian-Higgs strings bound orbits exist only if the gauge boson mass is greater than the Higgs boson mass. This changes for (p,q)-strings which are field-theoretically described by two interacting Abelian-Higgs models. The fact that the p D-strings and the q F-strings form bound states allows for bound orbits of massive test particles for Higgs boson mass larger than gauge boson mass. For both cases, massless test particles can only move on escape orbits. The influence of the string parameters on observable phenomena such as the light deflection and the perihelion shift are also discussed.

GR 8.3 Do 9:10 30.45: 101

Frame Dependence of Quantum Corrections in Cosmology — •Christian Steinwachs — Institut für Theoretische Physik, Universität zu Köln, Zülpicher Strasse 77, 50937 Köln, Germany

In the context of cosmological models based on an inflaton field *non-minimally* coupled to gravity, one can remove the non-minimal coupling by performing a conformal transformation of the metric at the price of a more complicated potential.
On a *classical* level this is just a mathematical trick and the two frames – the original Jordan frame and the minimally coupled Einstein frame – are equivalent. The question is now if this still holds at the *quantum* level. We will answer this question for a very general model by calculating and comparing explicitly the corresponding results at the one-loop level. This model is suitable for most of the cosmological applications.

GR 8.4 Do 9:30 30.45: 101

Quantum theory of fermion preheating — Jürgen Berges, •Daniil Gelfand, and Jens Pruschke — Institut für Kernphysik, TU Darmstadt, Deutschland

We show that quantum effects dramatically influence the production of fermions during preheating after inflation in the early universe. So far, nonequilibrium fermion production has been mainly investigated using the Dirac equation with coupling to a homogeneous classical inflaton field. We extend this analysis by taking into account quantum corrections including scattering and decay processes, as well as off-shell and memory effects. This is done by using two-particle irreducible (2PI) effective action techniques, which we compare to results from lattice simulations.

GR 8.5 Do 9:50 30.45: 101

Inflationary Correlation Functions without Infrared Divergencies — •Mischa Gerstenlauer — Institut für Theoretische Physik, Heidelberg

Inflationary correlation functions are potentially affected by infrared divergences. For example, the two-point correlator of curvature perturbations at momentum k receives corrections $\sim \ln(kL)$, where L is the size of the region in which the measurement is performed. We define infrared-safe correlation functions which have no sensitivity to the size L of the box used for the observation. The conventional correlators with their familiar log-enhanced corrections (both from scalar and tensor long-wavelength modes) are easily recovered from our IR-safe correlation functions. Among other examples, we illustrate this by calculating the corrections to the non-Gaussianity parameter f_{NL} coming from long-wavelength tensor modes. In our approach, the IR corrections automatically emerge in a resummed, all-orders form. For the scalar corrections, the resulting all-orders expression can be evaluated explicitly.

GR 8.6 Do 10:10 30.45: 101

Fluctuations of cosmic parameters in the local universe — •Alexander Wiegand and Dominik Schwarz — Fakultät für Physik, Universität Bielefeld, Universitätsstraße 25, D-33615 Bielefeld

Many cosmological observations use measurements in the local universe to determine the global cosmic parameters. As there are pronounced structures on these relatively small scales, the local values are not necessarily representative for the average universe. The talk will address the question how big this cosmic variance still is in the era of deep galaxy surveys, i.e. quantify this fundamental uncertainty in surveys with different geometries. Furthermore, the influence of these fluctuations on the evolution of the local volume will be discussed. As especially the curvature parameter is affected by a relatively large variance, it will finally be shown how this affects other observables.