GR 11: Kosmologie 2

Zeit: Mittwoch 14:00–15:20 Raum: JUR K

GR 11.1 Mi 14:00 JUR K

divide et impera: Partitioning the average universe — •Alexander Wiegand[1] and Thomas Buchert[2] — [1]Fakultät für Physik, Universität Bielefeld, Universitätsstraße 25, D-33615 Bielefeld — [2]Université Lyon 1, CRAL, 9 avenue Charles André, F-69230 Saint-Genis-Laval

Cosmological backreaction suggests a link between structure formation and the expansion history of the Universe. In order to quantitatively examine this connection we dynamically investigate a volume partition of the Universe into over– and underdense regions. This allows to trace structure formation using the volume fraction of the overdense regions $\lambda_{\mathcal{M}}$ as its characterizing parameter. Employing results from cosmological perturbation theory, and under the assumption of an initial near to homogeneous Gaussian density field, we construct a three–parameter model for the effective cosmic expansion history, involving $\lambda_{\mathcal{M}_0}$, the matter density and the Hubble rate of today's Universe.

The talk presents the resulting model and first tests of its capability to explain what we know about the evolution of the Universe, in the backreaction context. Furthermore, the possible benefits of an application of the partitioning approach to more general cases will be discussed.

GR 11.2 Mi 14:20 JUR K

Probing Backreaction Effects with Supernova Data — •Marina Seikel and Dominik J. Schwarz — Universität Bielefeld

As the Einstein equations are non-linear, spatial averaging and temporal evolution do not commute. Therefore, the evolution of the averaged universe is affected by inhomogeneities. It is, however, highly controversial how large these cosmological backreaction effects are. We use the supernova data of the Constitution set up to a redshift of 0.1 in order to analyse to what extent the measurement of the Hubble constant is affected. The size of the effect depends on the size of the volume that is averaged over. The observational results are then compared to the theory of the backreaction mechanism.

GR 11.3 Mi 14:40 JUR K

Propagation of vacuum bubbles on dynamical backgrounds — •Dennis Simon[1], Julian Adamek[1], Aleksandar Rakic[1], and Jens Niemeyer[1,2] — [1]Institut für Theoretische Physik und Astrophysik, Universität Würzburg, Am Hubland, D-97074 Würzburg, Germany — [2]Institut für Astrophysik, Universität Göttingen, Friedrich-Hund-Platz 1, D-37077 Göttingen, Germany

In the context of nucleation of vacuum bubbles by Coleman-De Luccia tunneling we focus on the propagation of such bubbles in matter dominated FLRW and LT backgrounds. Using a thin wall approximation and the Israel junction method we solve the equations of motion and show that, in contrast to the standard de Sitter scenario, bubbles in dust dominated backgrounds can not expand. Furthermore the presence of dust and curvature inhomogeneities hardly affects the trajectory of the domain wall and therefore has no influence on the cosmology inside the bubble. However, a sudden phase transition in the matter background changes the motion of the bubble and raises the question whether this leads to potentially observable effects, e.g. in the CMB.

GR 11.4 Mi 15:00 JUR K

Dark strings interacting with cosmic strings — •Betti Hartmann[1], Yves Brihaye[2], and Farhad Arbabzadah[1] — [1]Jacobs University Bremen, Germany — [2]Universite de Mons, Belgium

Dark strings are a prediction of new dark matter models that try to explain the excess electronic production in the galaxy. In this talk, I will discuss the interaction of these dark strings with cosmic strings. The main result is that cosmic strings can lower their energy when interacting with dark strings, which might have consequences for the evolution of cosmic string networks.