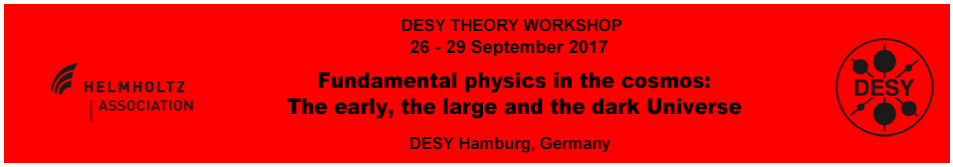

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Testing the CDM paradigm with the CMB

Wednesday 27 September 2017 16:56 (17 minutes)

Dark Matter (DM) is a crucial component of the universe and, for calculations of the cosmic microwave background (CMB), is successfully modelled as a pressureless perfect fluid within General Relativity (GR).
With data from Planck it becomes possible to test generalisations of this model, searching for DM properties beyond the pressureless perfect fluid and thereby testing the CDM paradigm itself.
Although there is no unique way to generalise a pressureless perfect fluid, the Generalised Dark Matter (GDM) model has proven useful in CMB applications. The 3 new parameters of the model describe DM is an imperfect fluid with pressure and shear viscosity. Furthermore we construct a second and more general model, based on the Parametrized Post Friedmann (PPF) parametrization.
We present our constraints from Planck data for constant and generally time dependent GDM parameters, finding no evidence for DM properties beyond that of a pressureless perfect fluid.
PPF has more freedom than GDM and encompasses more drastic deviations from CDM in which DM effects are a manifestation of modifying GR rather than that of a matter field.
Using PPF, we show that in the case of purely modified gravity, where the DM phenomenon is not associated with any degree of freedom, Planck data cannot be fit without fine-tuning.

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