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The challenges of ΛCDM and the physics transition approaches

Thursday 7 September 2023 09:00 (1 hour)

I first review the three main classes of observational challenges to the standard cosmological model (ΛCDM) the Hubble tension, the growth of perturbations tension and the cosmic dipoles. I then focus on essence of the Hubble tension and describe the assumptions involved in its existence. I also classify the models that have been proposed for its resolution in three broad classes Early time models that change the sound horizon scale, late time models that deform the Hubble expansion history H(z) and ultralate time models that change the physics of the late time distance calibrators (SnIa, Cepheids, TRGB etc). I show that in each one of these classes the most succesful representative models involve some kind of abrupt event (transition) that may occur either at early times before recombination (z>1100, eg new early dark energy) or at late times (z˜1, eg sign switching cosmological constant) or at ultralate times (z<0.01 eg gravitational transition that changes the physics of SnIa). The potential of each class to resolve the other two challenges will be briefly discussed. Finally, I focus on the ultralate late class of models and discuss observational hints for their predicted signals and possible theoretical models that may support them.

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