

Mini-Workshop: Theoretical implications on the first results of the Desi experiment

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Dark Radiation with Baryon Acoustic Oscillations from DESI 2024 and the H0 tension

Friday, 24 May 2024 11:45 (1h 15m)

I will present a search for extra relativistic degrees of freedom, or dark radiation (DR), in the early Universe in light of the recent measurements of Baryon Acoustic Oscillations (BAO) by the DESI collaboration, contributing to the so-called effective number of neutrinos N_{eff} . We analyze one-parameter extensions of the Λ CDM model where dark radiation is free streaming or behaves as a perfect fluid, due to self-interactions.

We report a significant relaxation, with respect to previous BAO data, of upper bounds on N_{eff} when employing Planck data (and supernovae data from Pantheon+). Applying constraints from Big Band Nucleosynthesis (BBN) leads to slightly tighter constraints, but they can be avoided if DR is produced after BBN.

For fluid DR we estimate the “H0 tension” with the SH0ES measurement to be around 2.3-2.8 sigma level, and for free-streaming DR the tension is below 3 sigma, if production occurs after BBN. This lesser degree of tension motivates a combination with SH0ES in these cases, resulting in a 4.4-5 sigma evidence for dark radiation and large improvements in χ^2 over Λ CDM (from -18 to -25).

Presenter: NOTARI, Alessio (Universitat de Barcelona)