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Nonthermal hot DM from early matter dominated epoch and S_8 anomaly

Decay of the inflaton or moduli which dominated the energy density of the universe at early times leads to a matter to radiation transition epoch. We consider nonthermal sterile dark matter (DM) particles produced as decay product during such transitions. The particles have a characteristic energy distribution—that associated with decays taking place in a matter dominated universe evolving to radiation domination. We primarily focus on the case when the particles are hot dark matter, and study their effects on the cosmic microwave background (CMB) and large scale structure (LSS), explicitly taking into account their nonthermal momentum distribution.

we explore the possibility that the 'S_8 -tension' is due to a non-thermal hot dark matter (HDM) fractional contribution to the universe energy density leading to a power suppression at small-scales in the matter power spectrum. Taking the specific example of a sterile particle produced from the decay of the inflaton during a matter dominated era, we find that from Planck only the tension can be reduced below 2σ

Primary authors: Prof. DAS, Subinoy (indian institute of astrophysics bangalore); Prof. MAHARANA, Anshuman; Dr POULIN, Vivian; Mr SHARMA, Ravi kumar (indian institute of astrophysics bangalore)

Presenter: Mr SHARMA, Ravi kumar (indian institute of astrophysics bangalore)

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