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Stepped Partially Acoustic Dark Matter (SPartAcous)

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In this talk, we present a new interacting dark sector model, Stepped Partially Acoustic Dark Matter (SPartAcous), that can tackle two major issues in current cosmological data, namely the H_0 and S_8 problems. Similar to Partially Acoustic Dark Matter (PAcDM), this model involves a part of dark matter that interacts with dark radiation at high temperatures, resulting in a decrease in the formation of structure at small scales and thus, solving the S_8 problem. However, in the SPartAcous model, the dark radiation comprises a light component that becomes non-relativistic near the time of matter-radiation equality. As this light component annihilates, the remaining dark radiation warms up, leading to a step-like increase in the relative energy density in dark radiation. This step-like increase significantly mitigates the H_0 tension. Moreover, dark matter and dark radiation become decoupled, ensuring that the power spectrum at larger scales is similar to that of ΛCDM.

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