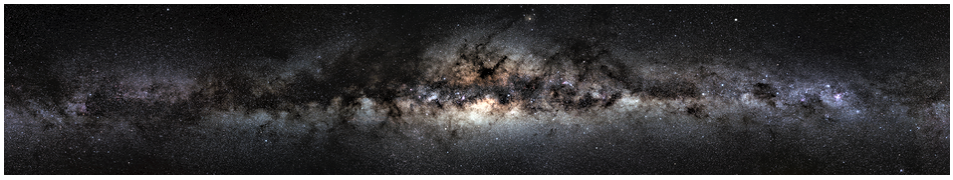

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# A Cosmologically Consistent Millicharged Dark Matter Solution to the EDGES Anomaly

*Tuesday 7 December 2021 08:20 (30 minutes)*

Analysis of EDGES data shows an absorption signal of the redshifted 21-cm line of atomic hydrogen at $z \sim 17$ which is stronger than expected from the standard $\Lambda$CDM model at a $3.8\sigma$ deviation. We present a particle physics model for the baryon cooling where a fraction of the dark matter resides in the hidden sector with a $U(1)$ gauge symmetry and a Stueckelberg mechanism operates mixing the visible and the hidden sectors with the hidden sector consisting of dark Dirac fermions and dark photons. The Stueckelberg mass mixing mechanism automatically generates a millicharge for the hidden sector dark fermions providing a theoretical basis for using millicharged dark matter to produce the desired cooling of baryons seen by EDGES by scattering from millicharged dark matter. We compute the relic density of the millicharged dark matter by solving a set of coupled equations for the dark fermion and dark photon yields and for the temperature ratio of the hidden sector and the visible sector heat baths. For the analysis of baryon cooling, we analyze the evolution equations for the temperatures of baryons and millicharged dark matter as a function of the redshift. We exhibit regions of the parameter space which allow consistency with the EDGES data. We note that the Stueckelberg mechanism arises naturally in strings and the existence of a millicharge would point to its string origin.

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