Contribution ID: **3** Type: **not specified**

21 cm cosmology and spin temperature reduction via spin-dependent dark matter interactions

Thursday 26 September 2019 15:00 (20 minutes)

The EDGES low-band experiment has measured an absorption feature in the cosmic microwave background radiation (CMB), corresponding to the 21 cm hyperfine transition of hydrogen at redshift z simeq 17, before the era of cosmic reionization. The amplitude of this absorption is connected to the ratio of singlet and triplet hyperfine states in the hydrogen gas, which can be parametrized by a spin temperature. The EDGES result suggests that the spin temperature is lower than the expected temperatures of both the CMB and the hydrogen gas. A variety of mechanisms have been proposed in order to explain this signal, for example by lowering the kinetic temperature of the hydrogen gas via dark matter interactions. We introduce an alternative mechanism, by which a sub-GeV dark matter particle with spin-dependent coupling to nucleons or electrons can cause hyperfine transitions and lower the spin temperature directly, with negligible reduction of the kinetic temperature of the hydrogen gas. We consider a model with an asymmetric dark matter fermion and a light pseudo-vector mediator. Significant reduction of the spin temperature by this simple model is excluded, most strongly by coupling constant bounds coming from stellar cooling. Perhaps an alternative dark sector model, subject to different sets of constraints, can lower the spin temperature by the same mechanism.

Primary author: WIDMARK, Axel (Stockholm University)

Presenter: WIDMARK, Axel (Stockholm University)

Session Classification: Thursday evening talks