

Constraints on MeV dark matter using neutrino detectors and their implication for the 21-cm results

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Abstract content

The recent results of the EDGES collaboration indicate that during the era of reionization, the primordial gas was much colder than expected. The cooling of the gas could be explained by interactions between dark matter (DM) and particles in the primordial gas. Constraints from cosmology and particle experiments indicate that this DM should be light ($\sim 10\text{-}80$ MeV), milli-charged, and only make up a small fraction of the total amount of DM. Several constraints on the DM parameter space have already been made. We explore the still unconstrained space in the case that the milli-charged DM makes up for $\sim 1\%$ of the total DM, through the scenario in which this DM annihilates only into muon- and tau neutrinos. We set upper limits on the annihilation cross section using Super-Kamiokande data, and predict the upper limit that could be reached by future experiments like Hyper-Kamiokande. We show that these experiments might be able to reach the relevant parameter space predicted by EDGES, and therefore be capable to probe this DM scenario.

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