

The 21-cm forest as a simultaneous probe of the dark and bright of the universe

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Understanding the nature of dark matter and the first luminous objects of the universe is an indomitable urge of human beings. Various 21 cm signals from neutral hydrogen and various experiments have been proposed, or being used, to unveil the mysteries, but suffering from parameter degeneracies between particle physics and the unknown astrophysics at cosmic dawn. The 21-cm absorption lines from neutral hydrogen against higher-redshift background sources at cosmic dawn, known collectively as the 21-cm forest, are proposed to simultaneously probe the small-scale structures governed by the dark matter particle mass and the early heating history regulated by the formation of first galaxies. By measuring the 1-D power spectrum of the 21-cm forest on high-redshift quasar spectra, the upcoming Square Kilometre Array will be able to shed light on the nature of both the dark matter and the first galaxies.

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