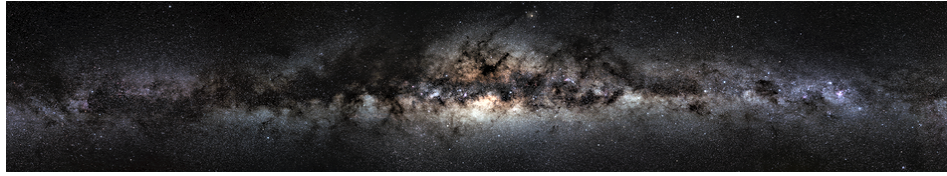


# Dark Sectors of Astroparticle Physics (AstroDark-2021): Axions, Neutrinos, Black Holes and Gravitational Waves



Contribution ID: 44

Type: Oral

## Cosmological Probes of Dark Matter Physics

*Tuesday, 7 December 2021 12:32 (18 minutes)*

Cosmology plays a central role in understanding the nature of dark matter (DM), with the power to test models which are hard to access by other means. The ultra-light axion is a compelling particle candidate that is motivated, e.g., by the string theory “axiverse” and as a possible solution to the so-called “small-scale crisis” of the cold dark matter model, if its mass is  $\sim 10^{-22}$  eV. I will present new, robust bounds on the axion mass that improve by over an order of magnitude relative to previous studies. This now significantly excludes the canonical mass scale of  $10^{-22}$  eV. The bounds exploit cosmological data from the cosmic microwave background, galaxy clustering, galaxy weak lensing and, in particular, spectroscopic observations of the intergalactic medium: the Lyman-alpha forest. In the search for light, sub-GeV dark matter, cosmology is highly complementary to direct detection experiments, which have limited sensitivity to light DM by nuclear recoil. I will present the strongest cosmological bounds on the dark matter – proton cross section for DM masses from 10 keV to 100 GeV. This exploits a dark matter “emulator”, which is a machine learning method to exploit the full power of cosmological simulations in setting limits.

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**Session Classification:** Parallel 1: Axions and Other Dark Matter Particles