Contribution ID: **7** Type: **not specified**

Impact of non-standard neutrino self interactions on sterile neutrino dark matter production in the early universe

Sunday 15 October 2023 10:43 (18 minutes)

Active-sterile mixing is the simplest mechanism to produce sterile neutrinos in the early Universe. However, the generic production mechanism, known as the Dodelson-Widrow mechanism, is in tension with the astrophysical bounds coming from structure formation and X-ray observations. Thus, it is necessary to introduce new interactions to modify the DW production, as this mechanism is unavoidable if we assume non-zero mixing between neutrino flavors. In contrast to previous studies, we employ an effective field theory treatment to introduce non-standard neutrino interactions to the early Universe. We work out the details of scalar, pseudoscalar and axial vector self-interactions with heavy mediators. We find that the production of keV sterile neutrinos can be enhanced or suppressed depending on the non-standard interaction strength, and this helps the mechanism evade astrophysical constraints or move closer to future experimental sensitivities

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Session Classification: Gravitational Waves and Astroparticle Physics