Contribution ID: **126** Type: **Oral**

The impact of axions on Mup

Tuesday, 26 June 2018 16:15 (15 minutes)

Axions are weak interactive bosons early introduced to solve the longstanding CP violation problem of strong interaction. If their mass is small enough (few keV or smaller), they can be produced in stellar interior, e.g., by Compton, Bremsthalung, pair annihilations or Primakoff processess, acting as an additional energy loss mechanism. We study the effect of axions in the evolution of stellar masses that are close to the minimum stellar mass that experiences central carbon burning, Mup. This mass limit is a fundamental property in astrophysics as it defines which stars produce carbon-oxygen white dwarfs (CO WDs) and, at the other side, those that produce oxygen-neon white dwarfs, electron-capture supernovae and normal core collapse supernovae (CCSNe). Hence, this mass limit is critical for the WD mass distribution, supernova progenitors, supernova rates, chemical evolution of galaxies and so on.
We explore a set of values for the axion coupling constant to photons and electrons, within current constraints. Our results show that axions may increase Mup till values that are in tension with the observationaly derived minimum mass of CCSNe progenitors and with the maximum stellar mass that produces a CO WD. This is the first study that considers axion effect in this stellar mass range, and on Mup.

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Session Classification: Particle Astrophysics