Stellar constraints to axions-like particles and the need of precise He-burning reaction rates

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Stars are potential astroparticle laboratories where hypothetical "new physics" can be tested and, then, validated or rejected [1],[4],[5],[6]. The procedure consists in the determination of observables stellar properties [3],[4],[5] (such as luminosity, temperature, radius, chemical composition or lifetime) that are affected by the inclusion of this new physics. As an example, we have investigated the effect of the production of axion-like particles during the core He burning phase [2],[5]. We will show, in particular how the uncertainties on the "standard physics", such as those related to nuclear reaction rates, limit this investigation. In particular, we will discuss the sensitivity of the constraint to the axion mass to a variation of the main nuclear energy sources, i.e., the 3-α and the ^{12}C+ α reactions.

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