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# Energy Loss in Cepheids: Axions, Period-Luminosity Relation, and Hubble Tension

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Axions are considered a promising candidate for dark matter due to their small mass and the potential for large-scale production in stellar environments, which can significantly affect stellar evolution. Cepheid variables are particularly sensitive to axion production, as it may eliminate the blue loop stages of their evolution. This alteration effectively removes certain evolutionary phases of Cepheids, leading to constraints on the axion coupling $g_{10}$.To investigate this, we simulate the pulsations of Cepheid variables and calculate the modified period-luminosity relations, revealing how axions influence their pulsation characteristics. We then compare these new pulsation models with theoretical astrophysical modeling to assess their implications for the current Hubble tension. This approach provides insights into both the properties of axions and their impact on cosmic measurements, potentially reconciling discrepancies in the determination of the Hubble constant.

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