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Theoretical Physics Seminar Series

Decay and lifetime of oscillons coupled to an external scalar field: Insights from instability band analysis

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Abstract: Oscillons are long-lived, spherically symmetric solitons that can arise in real scalar field theories with potentials shallower than quadratic ones. They are considered to form via parametric resonance during the preheating stage after inflation and have extended lifetimes. However, the estimation of their lifespan becomes complicated when taking into account the interactions between the inflaton field and other fields, as naturally expected in realistic reheating scenarios. In this study, we investigate how the lifetime of a single oscillon is affected by the coupling to the external real scalar field. By numerically computing the instability bands of the external field with the inhomogeneous oscillon profile as background, we show that the resonance behavior depends intricately on the coupling strength and shape of the oscillon. We analyze distinct instability mechanisms that dominate across different regimes of the coupling strength and oscillon shapes. Especially, we show that the parametric resonance fails to occur when the oscillon size is too limited to drive enhancement of the external field.

Prof. A. Chamorro Seminar Room, Theoretical Physics Seminar Room

MONDAY, Dec. 1st, 2025

Time: 12:00 pm