Contribution ID: **79** Type: **Oral presentation**

Time dependent dynamics of nuclear many-body states

Monday, 24 June 2024 15:10 (20 minutes)

The exponential decay of unstable states is one of the most pervasive and most studied phenomena in microscopic physics, yet its quantum-mechanical theory remains obscure in many ways. The exponential decay is not a trivial consequence of quantum dynamics; rather, it emerges from a complex equilibrium involving a resonant state with a decaying amplitude and a rotating phase, balanced by the effects of outgoing radiation.

Crucial to our understanding are the early and late-time dynamics, particularly in the context of weakly bound nuclear states in exotic nuclei. Unlike their bound counterparts, these states retain a 'memory' of their formation and background components, a history that manifests in their non-exponential decay dynamics. This memory aspect opens a window into the nuanced transient stages between different decay regimes, often marked by interference among various contributions. These interferences manifest as oscillations in the decay curve and correlations in the decay products, offering rich insights into the decay process.

Our presentation will focus on the latest research efforts aimed at unraveling these complex phenomena. We will explore innovative methodologies and experimental approaches to observe and interpret these dynamics in nuclei. The insights gained promise to enhance our understanding of quantum decay dynamics and its application in nuclear physics.

Collaboration

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Session Classification: Monday afternoon 1