NUCLEAR SEMINAR SERIES

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4:00 pm - Rm 123 NSH

Neutron-rich helium isotopes: complex made simple

We demonstrate that the intricate energy spectrum of neutron-rich helium isotopes can be straightforwardly described by taking advantage of the low-energy properties of neutron-neutron interaction and the scale separation that is present in diluted dripline systems. By using arguments based on the halo effective field theory, we carry out a parameter reduction of the complex-energy configuration interaction framework in the spd space, including resonant and scattering states. By constraining the core potential to alpha-n scattering phase-shifts and adjusting the strength of the spin-singlet central neutron-neutron interaction, we reproduce experimental energies and widths of 5-8He within tens of keV precision. We predict a parity inversion of narrow resonances in 9He and show that the ground state of 10He is an s-wave-dominated configuration that could decay through two-neutron emission. This threshold state can be viewed as a "double-halo" structure in an analogy to the atomic 3He(4He)2 trimer.

PHYSICS

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