Efimov States and Their Fano Resonances in 2-n Halo Nuclei

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The discovery of light neutron rich nuclei near the drip line showing either a pronounced halo of one or two neutrons or a neutron skin of several neutrons have opened up new vistas in contemporary nuclear physics. The first part of this talk will be devoted to an introduction to the discovery of halo nuclei and the global efforts in this direction. We will then introduce the result of our calculations using a three-body model to understand the key structural properties of these nuclei.
The 2-neutron halo nuclei are the ideal candidates for studying the Efimov effect in atomic nuclei. In the second part of the talk we will present our work to investigate the occurrence of Efimov states in 2-neutron halo nuclei, like, ^{14}Be, ^{19}B, ^{20}C, ^{22}C. The nucleus ^{20}C, considered as a three body system consisting of n+n+^{18}C(core), appears to be one of the most promising candidates to produce the Efimov states [1]. We will also present the result of our calculations to study the evolution of the bound Efimov states into resonances with increasing 2-body (neutron-core) binding energy. The key question to be addressed is whether the Efimov states, with the increase in potential strength, move over to virtual states in the unphysical sheet or two of the Efimov states collide to produce a resonance pair, one of which may come close to the scattering region and produce an observable effect on the physical scattering process [2]. Evolution of the Efimov states in ^{20}C, ^{38}Mg and ^{32}Ne into asymmetric resonances will be presented. Finally, we will tie up the emergence of the asymmetric resonances with the Fano phenomenon and discuss its implication for the possible experimental observation of Efimov states in the atomic nuclei [3], [4].

References

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