Nuclear halos and Efimov effect: A three-body approach

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The advancement in the production of energetic radioactive ion beams (RIB) have opened up new vistas in contemporary nuclear physics. On one hand it provides the means to explore the structural properties and reaction dynamics of nuclei near the drip lines. On the other hand some of the light, neutron-rich nuclei with their 2-neutron halo structure, characterized by large spatial extension and very low separation energy of the neutrons, have emerged as ideal candidates to search for exotic quantum mechanical effects like the Efimov Effect. 2-neutron halo nuclei are the ideal candidates for studying the Efimov effect in atomic nuclei. After a brief introduction to the Efimov effect and its universal features in three-body systems we shall discuss the search for Efimov states, within the framework of our model calculations, in 2n-halo nuclei, like, ^{14}Be, ^{19}B, ^{20,22}C [1] etc. It will be shown that a non-Borromean nucleus like ^{20}C is more vulnerable to admit Efimov states than Borromean nuclei like ^{14}Be or ^{19}B [2]. The important finding of the evolution of bound Efimov states into resonances with increasing 2-body (neutron-core) binding energy will be discussed [3]. 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 like ^{20}C, ^{36}Mg and ^{32}Ne [4],[5].

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