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Discrete scale symmetry and non-integer dimensions in few-body systems at the unitarity limit

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Discrete scale symmetry exhibited by few-particle systems for resonant s-wave interactions is affected by squeezing or by reducing the embedding dimension. The Efimov geometrical separation ratio between the AAB bosonic bound states energies increases as the system is squeezed until the geometrical spectrum disappears for a critical non-integer dimension. This is found either by solving the generalization of the Skornyakov and Ter-Martirosyan equations in non-integer dimensions or by implementing, in configuration space, the Bethe-Peierls boundary conditions at zero-range. Results for the one-body momentum density focusing on the dependence of the contacts on the non-integer dimension will be shown. Mass imbalanced systems with different cold-atom compositions are then explored. Going to more particles, we also provide a general discussion on how the discrete scaling symmetry presents itself in limit-cycles for particular bosonic systems. Following that, and beyond three particles, we will present results obtained by means of the Born-Oppenheimer approximation for two-heavy impurities immersed in squeezed light-boson systems in non-integer dimensions, which will be finally illustrated for lithium and two caesium atoms mixtures.

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