Geometries in Efimovian Systems

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Systems of strongly interacting particles exhibit non-trivial many-body effects. Notably, three (or more) particle systems near the unitary limit can demonstrate the Efimov effect: a phenomenon where an infinite series of bound states emerge, with their energies forming a geometric progression. Interestingly, not all particles need to interact resonantly for the Efimov effect to manifest. For instance, it can occur in systems of three equal-mass particles where only two pairs are strongly interacting. This scenario can be visualized as a particle connected to two others via a resonant interaction, resembling a Lambda (Λ) shape.

In contrast, when all three particles interact strongly, the system forms a Delta (Δ) shape, with each particle connected via interacting links. These Lambda and Delta configurations represent the only two non-trivial fundamental three-body arrangements. However, as we extend our consideration to four- and many-body systems, additional configurations emerge.

In this talk, I will analyze and categorize these configurations based on their geometric arrangements (1 in the four-body case) and their Efimovian behavior. Furthermore, I will discuss numerical findings in the context of many-body systems and their implications for potential experimental observations.

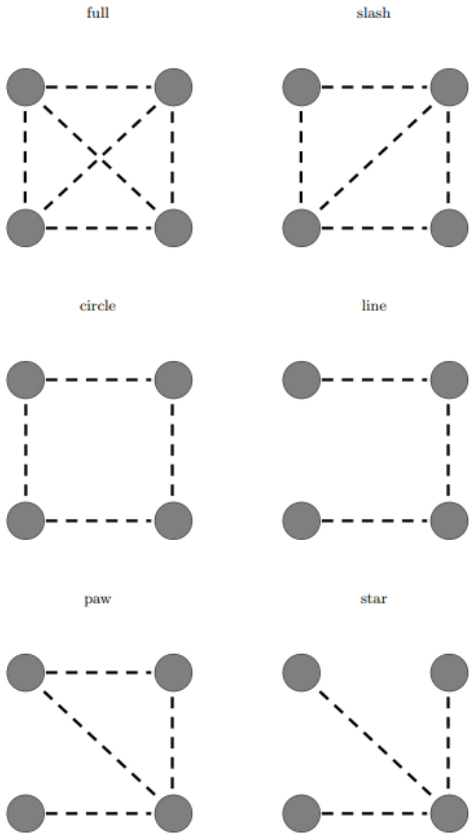

Figure 1: Configurations of 4 distinguishable particles (gray vertices) for which their resonant pair interactions (dashed lines) form a connected graph