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Origin of the Three-body Parameter Universality in Efimov Physics¹ JIA WANG, J.P. D'INCAO, Department of Physics and JILA, University of Colorado, Boulder, B.D. ESRY, Department of Physics, Kansas State University, CHRIS H. GREENE, Department of Physics and JILA, University of Colorado, Boulder — One of the most fundamental theoretical assumptions concerning Efimov physics is that the three-body parameter depends on the precise details of the short-range two- and three-body interactions, i.e., it is not a universal parameter. Surprisingly, and contrary to this assumption, recent experiments exploring Efimov physics in ultracold quantum gases have found that the three-body parameter is universal. The present study investigates the origin of the universality of the three-body parameter in identical bosonic systems using the adiabatic hyperspherical representation. Our study shows that the universality of the three-body parameter emerges because a universal effective barrier in the important three-body potential prevents the three particles from simultaneously getting close to each other. Our results also set limits on this universality, showing it to be more likely to occur for neutral atoms and less likely to extend to light nuclei.

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