Efimov resonances in an ultracold mixture

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Efimov states, an infinite series of three-body bound states with discrete scale invariance when a two-body scattering length diverges, provided us a unique opportunity to investigate the properties of few-body physics both theoretically and experimentally. We studied multichannel Efimov physics using ultracold heteronuclear admixtures of K and Rb atoms. We observe a shift in the scattering length where the first atom-dimer resonance appears in the 41K-87Rb system[1] relative to the position of the previously observed atom-dimer resonance in the 40K-87Rb system.[2] This shift is well explained by our calculations with a three-body model including van der Waals interactions, and, more importantly, multichannel spinor physics.[1] With only minor differences in the atomic masses of the admixtures, the shift in the atom-dimer resonance positions can be cleanly ascribed to the isolated and overlapping Feshbach resonances in the 40K-87Rb and 41K-87Rb systems, respectively. Our study demonstrates the role of multichannel Feshbach physics in determining Efimov resonances in heteronuclear three-body systems.

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