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Shape effects in low energy Feshbach resonances RYAN KALAS, EDDY TIMMERMANS, Los Alamos National Lab — We study finite interaction range effects in two-body collisions of ultra-cold, neutral atoms near a magnetically controlled, low energy Feshbach resonance. The finite range of the inter-particle interactions gives rise to a characteristic momentum dependence of the scattering amplitude that is traditionally described by the effective range expansion. The coupled channel Feshbach resonance gives an effective range that varies as the magnetic field sweeps through the resonance and that diverges near the the zero-crossing point (corresponding to the magnetic field value of vanishing scattering length). To describe the interactions near the zero-crossing point, we propose an effective potential expansion to replace the expansion of the effective range. The model in which we work assumes an interaction potential in the open channel that is a separable potential, which allows analytical calculations for arbitrary interaction strengths. The results reveal important general trends and suggest a greatly simplified description of a narrow Feshbach resonance in terms of the magnetic-field shifted scattering length.

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