Abstract Submitted
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Approaching the universal loss regime in cold and ultracold molecular collisions[1] PAUL S. JULIENNE, Joint Quantum Institute (JQI), NIST and the University of Maryland, MATTHEW D. FRYE, JEREMY M. HUTSON, Joint Quantum Center (JQC) Durham-Newcastle, Durham University — We investigate properties of single-channel quantum defect models of cold atomic and molecular collisions that take account of inelastic and reactive processes using a single parameter to represent short-range inelastic or reactive loss. We present plots of the resulting energy-dependence of elastic and inelastic cross sections over the full parameter space of loss parameters and short-range phase shifts. We then test the single-channel model by comparing it with the results of coupled-channel calculations of rotationally inelastic collisions between vibrational ground state LiH molecules and Li atoms. We find that the range of cross sections predicted by the single-channel model becomes increasingly accurate as the initial LiH rotational quantum number increases, with a corresponding increase in the number of open loss channels. The results suggest that coupled-channel calculations at very low energy (in the s-wave regime) could in some cases be used to estimate a loss parameter and then to predict the range of possible loss rates at higher energy without the need for explicit coupled-channel calculations for higher partial waves.

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