Abstract Submitted
for the TSF19 Meeting of
The American Physical Society

Understanding Quantum Defect Theory for Cold Atoms and Molecules ALYSON LASKOWSKI, Trinity University — Interactions between ultracold diatomic molecules are characterized by a deep potential energy well at short range, with a shallow long-range tail that prevails to large molecular separation. Quantum defect theory (QDT) exploits this separation of length and energy scales so that in the simplest single-channel approximation, one parameter which is weakly dependent on energy, the *quantum defect*, can be used to describe the short-range properties of the collision. The quantum defect can either be calculated numerically from an *ab initio* method or found from the solution of an effective short-range potential designed such that it reproduces the essential short-range physics. The long-range solutions are efficiently found using the Milne phase amplitude method. We present simple single-channel QDT models that make use of this separation of length and energy scales to treat real properties of ultracold atomic and molecular collisions.

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Date submitted: 07 Oct 2019 Electronic form version 1.4