Abstract Submitted
for the DAMOP05 Meeting of
The American Physical Society

Mapped Slow Variable Representation for three-body bound states VIATCHESLAV KOKOOULINE, Department of Physics, University of Central Florida — The adiabatic hyperspherical approximation is often used to calculate bound states of quantum three-body systems in atomic, molecular and nuclear physics. However, in many situations the accuracy of the energies and wavefunctions obtained in the approximation is not satisfactory. The widely used solution is to include non-adiabatic couplings represented by first and second derivatives with respect to the hyper-radius. However, because of many avoided crossings in adiabatic hyperspherical curves, it is difficult to include the coulings accurately. Another possible solution is to use the Slow Variable Representation (SVD). Using this method, we explore bound states of several three-body systems: The four isotopomers of the H_3^+ ion, the He_3 cluster, and a benchmark few-body problem of three bosons. For all the systems, the bound energies obtained using SVD are in good agreement with previous accurate calculations. To represent properly vibration of the He_3 cluster, we use the mapped Fourier grid method. The mapping is made only in the hyperradial coordinate. It allows us to reduce significantly the number of sampling points and the calculation time.

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Date submitted: 28 Jan 2005 Electronic form version 1.4