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Академич О.Чулуунбаатар, МТТХ,
ШУ-ны доктор А.А.Гусев, ОХУ, Дубна, ЦШНИ.

The finite element method for solving 1D boundary value problems

The first FORTRAN version of the KANTBP program to calculate the energy values, reflection and transmission matrices (or reaction matrix) and the corresponding wave functions in the coupled channel approximation of the adiabatic approach was published in Computer Physics Communications in 2007. In this approach, the multidimensional Schrödinger equation is reduced to a system of coupled second-order ordinary differential equations on a finite interval with the homogeneous boundary conditions of the third type at the left- and right-boundary points for discrete spectrum and multichannel scattering problems. The corresponding boundary-value problems are solved by the finite element method using high-order accuracy approximations. Within 15 years, the KANTBP program has been updated in three FORTRAN versions and two MAPLE versions. The versions have been and are applied to solve various problems in atomic, molecular and nuclear physics.