DECAYING STATES OF MANY-BODY SYSTEM

M.V.Mihailović

J.Stefan Institute. University of Ljubljana. Ljubljana.

A variational method is developed[1] to determine the complex energy $W=E-\frac{1}{2}i\Gamma$ of a decaying state. The Gamow model[2] which uses solutions exponentially decaying with time and exponentially increasing with distance is used as an approximation to a straightforward calculation by means of wave packets.

The main features of the formalism are the following:

(i) A complete microscopic treatment of the many-body system is used wherein the antisymmetry of the wave functions in the internal and in the channel region is explicitly treated. Difficult implementation of the proper boundary condition through the Bloch operator[4] is avoided. The use of the two-centre generator coordinate basis which explicitly incorporate[3,1] the asymptotic boundary conditions enables us to describe the decay of a state into many channels.

(ii) The formalism is independent of any external channel radius parameters. There is a smooth transition between the internal and the external region.

(iii) The basis functions are quite flexible so that one can use either a single centre or a two-centre shell model wavefunctions. This feature is useful in the study of the decay (and resonance) of complex fragments.

The 'eigen' energies W_n are roots of a complex determinant whose elements are the expectation values of the operator $(H - W.I)$ between the square integrable N-body function $\{\Phi_n\}$ introduced to describe the compound system and the outgoing channel N-body functions $\{\mathcal{O}_\alpha\}$.

The formalism is applied to a simple but nontrivial model as an illustration.

Refs:, 1) B.Giraud, M.V.Mihailović, M.A.Nagarajan, to be published; 2) G.Gamow, Z.Phys. 51 (1928) 204; 3) M.V.Mihailović, L.J.B.Goldfarb, M.A.Nagarajan, Nucl.Phys. A273 (1976) 1207; 4) B.Bloch. Nucl.Phys. 4 (1957) 503.