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ODD-EVEN EFFECT AND NUCLEAR INERTIA IN FISSION PROCESSES FROM THE MICROSCOPIC EQUATIONS OF MOTION

M. Mirea*

Abstract

The time dependent pairing equations are obtained from the variational principle. The BCS occupation and vacancy amplitudes are supplied by these equations when the deformation of the nuclear system evolves in time. These equations were generalized to include the Landau-Zener promotion mechanism in superfluid systems. During the nuclear disintegrations, the single particle levels are rearranged. But, two single particle levels characterized by the same good quantum numbers cannot intersect and give rise to the so called avoided levels crossing regions. In such regions, it is possible that the nucleons promote from one level to another. By considering such mechanisms, a new dynamical pair breaking effect was evidenced. Within this formalism, the experimental fragment distribution obtained in cold fission was reproduced in the energy region were an inversion of the even-odd effect is observed. By taking into account the matrix elements of the time derivative operators in deducing the equations of motion, a new formula for the nuclear inertia was derived. This formula takes into account the dissipated energy. If the theory is particularized for adiabatic system, then the well known cranking formalism resorts.

keywords: time dependent pairing equations, pair breaking, nuclear inertia

*mirea@theory.nipne.ro Horia Hulubei National Institute for Physics and Nuclear Engineering, P.O. Box MG-6, 077125 Bucharest-Magurele, Romania; Academy of Romanian Scientists, Splaiul Independentei 54, 050094, Bucharest, Romania; This work was supported by the grants of Ministery of Research and Innovation, CNCS-UEFISCDI, project numbers PN-III-P4-ID-PCE-2016-0092, within PNCDI III.;