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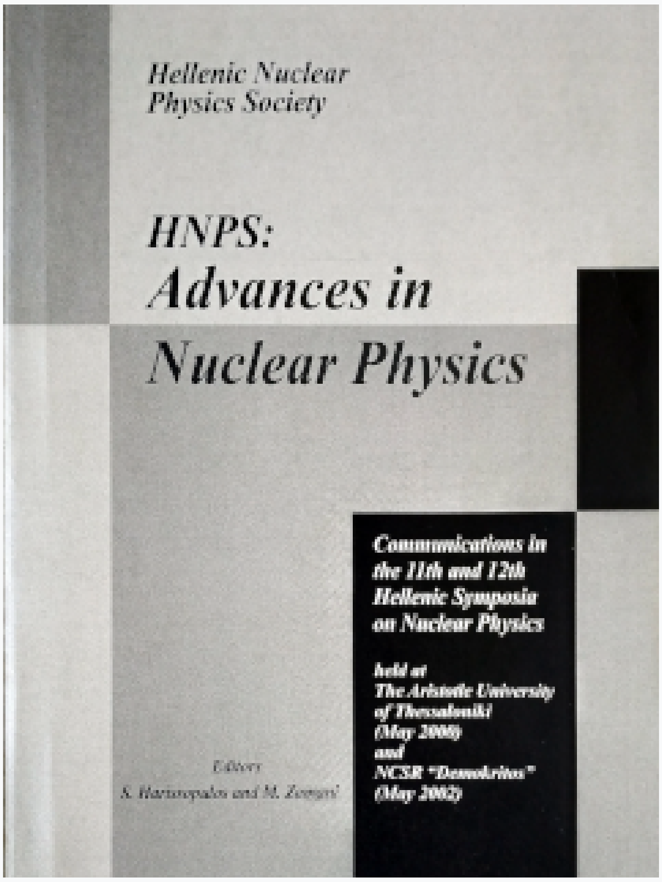

Deformed Hartree-Fock calculations for semileptonic processes in nuclei

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Deformed Hartree-Fock calculations for semileptonic processes in nuclei

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In nuclear structure calculations, the Deformed Hartree-Fock (DHF) provides generally a good description for the low-lying spectroscopic properties of odd-even, odd-odd and even-even nuclear systems of which the consideration of the deformation is motivated by many reasons. The common random phase approximations (RPA, QRPA, etc.) mostly used to accurately evaluate the transition matrix elements in many nuclear processes [1,2], are appropriate for only spherical even-even nuclear systems even though, sometimes, isotopes considered as rather deformed are studied.

In the present work, we discuss the treatment within the DHF method of nuclei in the region $A = 70 - 80$. This region includes isotopes (like ^{72}Ge, ^{76}Ge, ^{72}Se, etc) interesting for studying many nuclear processes as the $\beta\beta$-decay, scattering of dark matter candidates off nuclei, $\mu^- \rightarrow e^{\pm}$ conversions in nuclei. In our calculations the model space comprises $1p_{3/2}$, $0f_{5/2}$, $1p_{1/2}$ and $0g_{9/2}$ single particle orbitals assuming ^{56}Ni to be the inert core. The effective interaction employed, has been quite successfully used previously to describe many important features of the nuclei in this region. The lowest prolate Hartree-Fock single particle spectrum of some isotopes (^{72}Ge, ^{76}Ge) has been used to test the good angular momentum states which in this method are projected out from the intrinsic HF states.

As an application, we examine the predictions of DHF for the exotic (μ^-, e^-) conversion process. The contributions of all basic $\mu^- \rightarrow e^-$ operators originating from a general effective Lagrangian [2] are compared with those of normal QRPA methods obtained previously [1].

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[2] T.S. Kosmas, S. Kovalenko and I. Schmidt, Phys. Lett. **B 511**(2001)203; **519**(2001)78.