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Hartree-Fock deformed calculations in the rare-earth region

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A phenomenological density dependent two body interaction, denoted as  $D_1$ , has been recently proposed <sup>1)</sup> and shown to give excellent results in complete spherical Hartree-Fock and Hartree-Fock Bogolyubov calculations. C. Titin-Schneider and P. Quentin <sup>2)</sup> and ourself have used this interaction in deformed Hartree-Fock (H.F) calculations of s-d shell nuclei. Their and our results indicate that deformation properties in this region are rather well reproduced.

The purpose of this communication is twofold. On the one hand, to prove that extensive deformed H.F calculations do not require very simplified parameterization of the interactions as has usually been done up to now. On the other hand to show that the interaction "D 1" still behaves very satisfactorily when applied to nuclei of the rare-earth region.

The H.F calculations are carried out in an axially symmetric deformed harmonic oscillator basis whose dimension is given by the prescription:

$$2n_{\perp} + |m| + 1 + (n_z + 1/2) / q \leq \frac{N+2}{q^{1/3}} \quad \text{with } q = \frac{\hbar\omega_{\perp}}{\hbar\omega_z}$$

Pairing correlations are treated as described in reference 3, but in further work we shall introduce the pairing matrix elements of the interaction "D 1" itself.

The code we have constructed permits us to use bases of high dimension, such that  $N = 14$ . Furthermore, it already works with a constraint on the mass quadrupole moment so that, we shall be able very soon to calculate fission barriers of heavy nuclei.

- [1] D. Gogny Proceedings of the international conference on nuclear physics Vol. 1 Munich, August 27 - September 1, 1973
- [2] C. Titin-Schneider and P. Quentin To be published in Phys. Letters
- [3] H. Flocard, P. Quentin, A.K. Kerman and D. Vautherin, Nucl. Phys. A 203 (1973) 433