Abstract Submitted
for the APR06 Meeting of
The American Physical Society

Fully self-consistent Hartree-Fock RPA calculations for nuclear giant resonances TAPAS SIL, SHALOM SHLOMO, Cyclotron Institute, Texas A & M University, College Station, TX 77843, USA — The basic theory for the microscopic description of giant resonances is the Hartree-Fock(HF) based random phase approximation (RPA). A very accurate calculation within HF+RPA demands a sufficiently complete basis and in particular self-consistency, i.e., using exactly the same terms in the residual interaction that have been used in the underlying HF calculation. Apart from some fully self-consistent calculations most existing HF+RPA calculations are contaminated by self-consistency violation. We have carried out highly accurate fully self-consistent HF+RPA calculations for the strength functions of various modes of giant resonances for a host of nuclei. We check the accuracy of our calculations of the strength functions of giant resonances by comparing the RPA results with the corresponding ones of constrained HF for the case of isoscalar giant monopole (ISGMR) and the total energy weighted strengths with the corresponding energy weighted sum rule (EWSR). We have quantified very accurately the effects of self-consistency violation due to the omission of the spin-orbit (LS) and Coulomb (CO) particle-hole interaction on the centroid energy (E_C) which is commonly used to determine the nuclear matter incompressibility K. The effects of violations of self-consistency due to the ph LS or CO interactions are most significant for the ISGMR (3 to 5 times the experimental errors), leading to an uncertainty of around 20 MeV in K.

Shalom Shlomo
Cyclotron Institute, Texas A & M University, College Station, TX 77843, USA

Date submitted: 06 Jan 2006 Electronic form version 1.4