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Auxiliary field GFMC calculation on the possibility of a pion condensate state of neutron matter at high densities MOHAMED BOUADANI, Arizona State University — For a long time, theory has speculated on the possibility of a pion condensate phase for highly dense nuclear matter, in particular for neutron matter. Almost all calculations have been based on a mean field approach. The first known calculation using a realistic hamiltonian is the FHNC/SOC of Akmal-Pandharipande. There, the computation was only indirect in showing that at enough density and wavelength there seem to be a favorable high dense phase of matter inferred by the linear response study showing a pion excess which was "reasonably" attributed to the pion condensate state. The aim of the present work is to calculate the energy expectation for a liquid phase boxed-plane-wave function and a varied field-modulated wave function in the longitudinal direction of the box with plane wave orbitals in the transverse plane as suggested by the tensor interaction. The calculation is based on the fixed phase constrained auxiliary field GFMC method with potential the Argonne $v^{8\prime}$ and the urbana UIX three body interaction. The energy calculations and distribution statistics show that the potential gain overwhelms reasonably the kinetic increase for the one dimensional laminated structured wave-function reaching a maximum at 3.5 fm for $\rho/\rho_o \approx 5$. More importantly, our results show continuous variations with the defining parameters. The phase transition seems of the second order kind.

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