

4) Two body correlation function for strongly interacting bosons. Particle hole interaction in the paired phonon analysis.

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The α - α potentials that are relevant for α -matter calculation was reviewed in the scientific report for 2013. Low energy phase shift and the properties of the $J^\pi = 0^+$ resonance in ${}^8\text{Be}$ were reproduced accurately by potentials derived from the old Ali-Bodmer S-state potential. The relation with supersymmetric partners of the double folding potential with Gogny NN effective interaction was also established. Based on these potentials we studied the convergence and saturation properties of the equation of state of α -matter by including five order diagrams in the Percus Yevick approximation. We find essentially that the saturation point of the equation of state lies around and below the critical point (Mott density) and strongly depends on the repulsive component of the α - α potential. The calculated compressibility coefficient is $K_\infty \approx 160$ MeV suggesting a soft equation of state.

We extend our study for exotic nuclear matter by studying some nuclear reaction that are relevant for the explosive stage of supernovas and X-ray burst.