

Isovector nuclear matter properties and neutron skin thickness

Satoshi Yoshida ^a and Hiroyuki Sagawa ^b

^a *Science Research Center, Hosei University*

2-17-1 Fujimi, Chiyoda, Tokyo 102-8160, Japan

^b *Center for Mathematical Sciences, the University of Aizu*

Aizu-Wakamatsu, Fukushima 965-8580, Japan

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Abstract

Correlations among several nuclear matter properties are investigated in the Skyrme Hartree-Fock (SHF) and the relativistic mean field (RMF) models. The Skyrme parameters are related analytically to the isoscalar and the isovector nuclear matter properties of the Hamiltonian density. Linear correlations are found among the isovector nuclear matter properties of the Hamiltonian density in both the SHF and the RMF models. We show analytically a singularity at the incompressibility $K_c = 306$ MeV in correlations between the isovector nuclear matter properties and the incompressibility with the SHF model, whereas there is no obvious singularity in those correlations with the RMF model. A linear correlation between the neutron skin thickness and the pressure of the neutron matter is given in terms of the ratio between the neutron and nuclear matter densities in the SHF model. We show that the neutron skin thickness gives crucial information about not only the neutron EOS but also the isovector nuclear matter properties and the parameterization of Skyrme interaction.

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