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Properties of Nuclear and Neutron Matter in the Nonlinear σ-ω-ρ Dirac-Hartree-Fock Approximation HIROSHI UECHI[1], Osaka Gakuin Junior College — A self-consistent relativistic Dirac-Hartree-Fock (DHF) approximation in a nonlinear σ-ω-ρ mean-field model is discussed by employing conditions of the theory of conserving approximations. The approximation is applied to Fermi-liquid properties of nuclear matter and properties of neutron stars in order to produce the effective mass of nucleon, $M^*/M \sim 0.7$, incompressibility ~ 250 MeV, symmetry energy $a_4 \sim 30$ MeV, the maximum mass of neutron star $M_{star}/M_\odot = 2.5$, by adjusting coupling constants of nonlinear interactions. The results of nonlinear σ-ω-ρ Hartree approximation (NHA) and the linear Hartree (σ-ω) approximation (LHA) are listed in the table.

	M^*/M	m^*_σ/m_σ	m^*_ω/m_ω	K (MeV)	a_4 (MeV)	M_{max}
LHA	0.54	1.00	1.00	530	19.3	3.03
NHA	0.68	1.09	1.05	303	25.7	2.50

Since nonlinear self-interactions of mesons are renormalized as effective masses of mesons by self-consistency and strictly restricted by coupled equations of motion for mesons and baryons, the validity of nonlinear self-interactions of mesons would be examined by analyzing nuclear experimental data and properties of neutron stars.

[1]37-1-2 kisibe-minami, Suita, Osaka, 564-8511 Japan

Hiroshi Uechi
Japan Physical Society(JPS)

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