Compatibility of Neutron Star Masses and Hyperon Coupling Constants

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It is shown that the modern equations of state for neutron star matter based on microscopic calculations of symmetric and asymmetric nuclear matter are compatible with the lower bound on the maximum neutron-star mass for a certain range of hyperon coupling constants, which are constrained by the binding energies of hyperons in symmetric nuclear matter. The hyperons are included by means of the relativistic Hartree– or Hartree–Fock approximation. The obtained couplings are also in satisfactory agreement with hypernuclei data in the relativistic Hartree scheme. Within the relativistic Hartree–Fock approximation hypernuclei have not been investigated so far.

to be published in:
Zeitschrift f. Naturforschung **54a** (1999) ;
see also astro-ph/9811463

Symmetric and Asymmetric Nuclear Matter in the Relativistic Approach at Finite Temperatures

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The properties of hot matter are studied in the frame of the relativistic Brueckner-Hartree-Fock theory. The equations are solved self-consistently in the full Dirac space. For the interaction we used the potentials given by Brockmann and Machleidt. The obtained critical temperatures are smaller than in most of the nonrelativistic investigation. We also calculated the thermodynamic properties of hot matter in the relativistic Hartree–Fock approximation, where the force parameters were adjusted to the outcome of the relativistic Brueckner–Hartree–Fock calculations at zero temperature. Here, one obtains higher critical temperatures, which are comparable with other relativistic calculations in the Hartree scheme.

published in: Phys. Rev. **C57** (1998) 3484;
see also nucl-th/9803026

Symmetric and Asymmetric Nuclear Matter in the Thomas-Fermi Model at Finite Temperatures

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The properties of warm symmetric and asymmetric nuclear matter are investigated in the frame of the Thomas-Fermi approximation using a recent modern parametrization of the effective nucleon-nucleon interaction of Myers and Swiatecki. Special attention is paid to the liquid-gas phase transition, which is of special interest in modern nuclear physics. We have determined the critical temperature, critical density and the so-called flash temperature. Furthermore the equation of state for cold neutron star matter was calculated.

to be published in: Zeitschrift f. Naturforschung **54a** (1999) ;
see also nucl-th/9810003

A Comparative Study of Super- and Highly-Deformed Bands in the $A \sim 60$ Mass Region

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Super- and highly-deformed rotational bands in the $A \sim 60$ mass region are studied within cranked relativistic mean field theory and the configuration-dependent cranked Nilsson-Strutinsky approach. Both approaches describe the experimental data well. Low values of the dynamic moments of inertia $J^{(2)}$ compared with the kinematic moments of inertia $J^{(1)}$ seen both in experiment and in calculations at high rotational frequencies indicate the high energy cost to build the states at high spin and reflect the limited angular momentum content in these configurations.

submitted to Nucl. Phys. **A**