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High density behavior of the nuclear EoS and properties of massive neutron stars

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Modern constraints from the mass and mass-radius-relation measurements require stiff EoS at high densities, whereas flow data from heavy-ion collisions seem to disfavour too stiff behavior of the EoS. Our aim is to present a nuclear EoS at supernuclear densities which satisfies both the constraints from neutron star (NS) and the heavy ion collision phenomenology. The data from massive NSs and pulsars may provide an important cross-check between high-density astrophysics and heavy-ion physics. The variation of pressure with density for the present EoS is consistent with the experimental flow data confirming its high density behaviour. We find that the large values of gravitational masses (~2.0 M_solar) for the NSs are possible with the present EoS with the SNM incompressibility K=274.7 (7.4) MeV, which is rather stiff' enough at high densities to allow compact stars with large values of gravitational masses ~ 2 M_solar while the corresponding symmetry energy issuper-soft' as preferred by FOPI/GSI experimental data. Thus the DDM3Y effective interaction which is found to provide unified description of elastic and inelastic scattering, various radioactivites and nuclear matter properties, also provides excellent description of beta-equilibrated NS matter to allow the recent observations of the massive compact stars.

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Sitzung Einordnung: Session 7: Neutron stars, properties and EoS II