

Clusters in EoS Models

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TECHNISCHE
UNIVERSITÄT
DARMSTADT

Basel 2016

NewCompStar and Brainstorming and Fun

29.09. – 01.10.2016





comparison of different approaches

- ▶ identical RMF model for nuclear interaction (DD2 parametrization)
- ▶ geometric picture (finite size of particles)

⇒ **excluded-volume mechanism**

⇒ statistical model of M. Hempel and J. Schaffner-Bielich (HS)

M. Hempel, J. Schaffner-Bielich, Nucl. Phys. A 837 (2010) 210; S. Banik, M. Hempel, D. Bandyopadhyay, Astrophys. J. Suppl. 214 (2014) 22;

T. Fischer, M. Hempel, I. Sagert, Y. Suwa, J. Schaffner-Bielich, Eur. Phys. J. A 50 (2014) 46; M. Hempel, Phys. Rev. C 91 (2015) 055897

- ▶ medium modification of cluster properties (effect of Pauli principle)

⇒ **mass shifts**

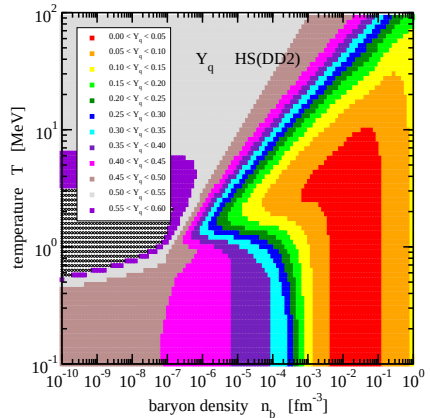
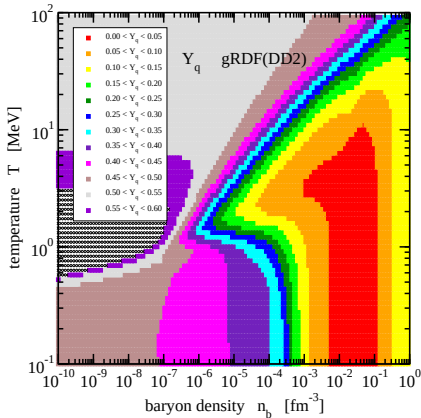
⇒ generalized relativistic density functional (gRDF)

S. Typel, G. Röpke, T. Klähn, D. Blaschke, H. H. Wolter, Phys. Rev. C 81 (2010) 015803; M. D. Voskresenskaya, S. Typel, Nucl. Phys. A 887 (2012) 42;

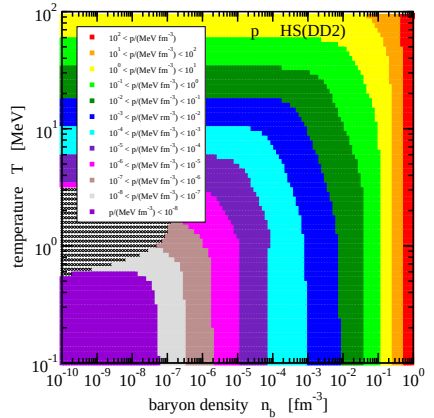
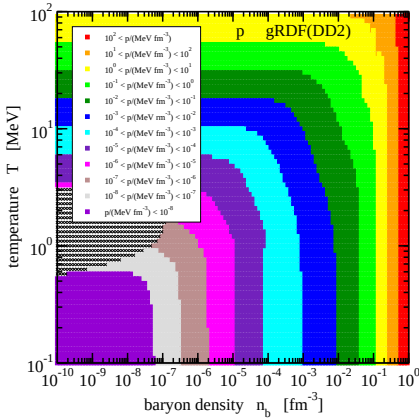
M. Hempel, K. Hagel, J. Natowitz, G. Röpke, S. Typel, Phys. Rev. C 91 (2015) 045805; S. Typel, arXiv:1504.01571 [nucl-th]

Hadronic Charge Fraction Y_q

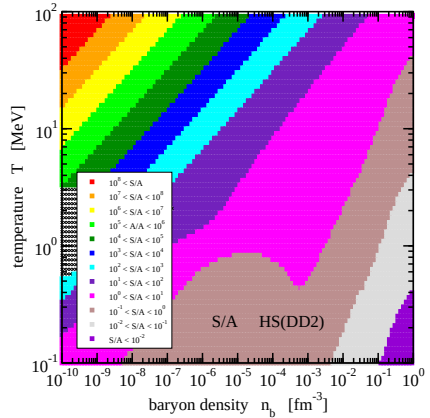
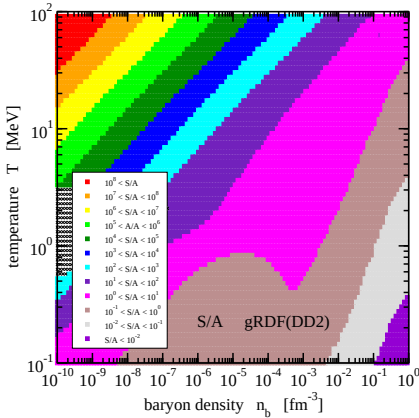
neutron star matter (charge-neutral stellar matter in β equilibrium)



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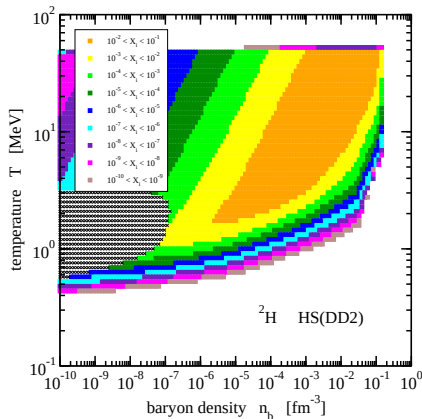
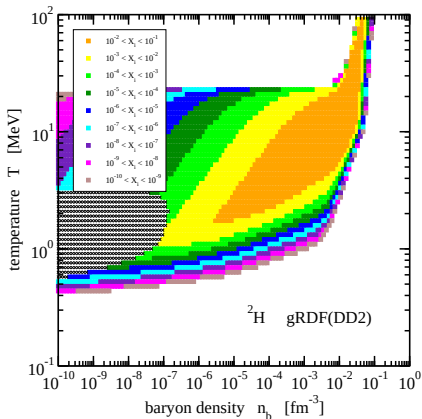
neutron star matter (charge-neutral stellar matter in β equilibrium)



Light Clusters

Mass Fraction X_d of ^2H

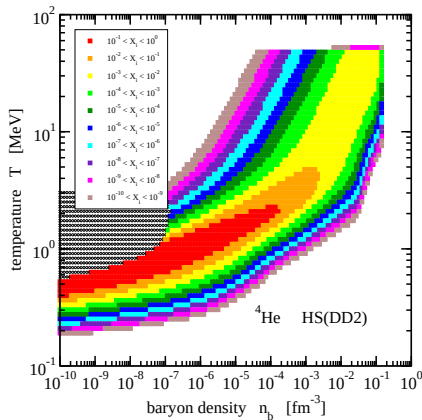
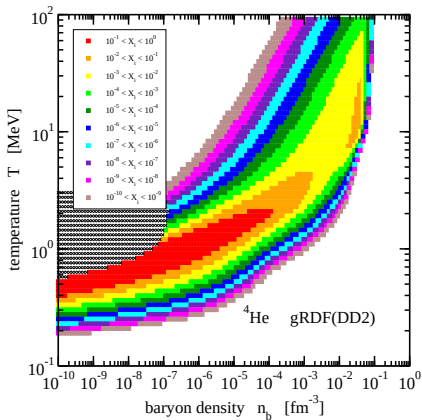
neutron star matter (charge-neutral stellar matter in β equilibrium)



Light Clusters

Mass Fraction X_α of ^4He

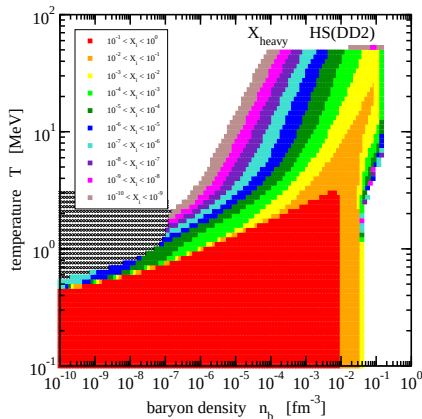
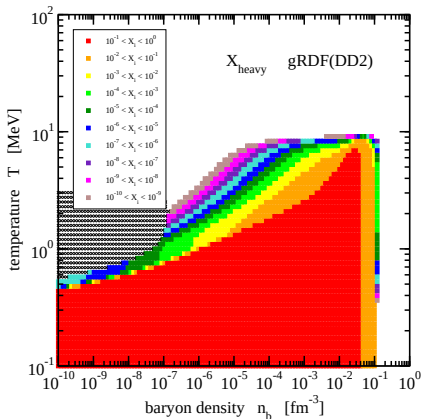
neutron star matter (charge-neutral stellar matter in β equilibrium)



Heavy Clusters

Mass Fraction X_{heavy} of Clusters with $A > 4$

neutron star matter (charge-neutral stellar matter in β equilibrium)



Heavy Clusters

Average Mass Number A_{av} of Clusters with $A > 4$

neutron star matter (charge-neutral stellar matter in β equilibrium)

