DDFGOS(APR) with unified crust

EoS Submission Details

EoS name	DDFGOS(APR) with unified crust
category	Hadronic
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Abstract

This table represents the zero temperature and β -equilibrium EoS by Akmal, Pandharipande and Ravenhall using variational techniques [1], interaction $A18 + \delta v + UIX^*$. The transition to the pion condensed phase at high densities is handled as a first order phase transition with two homogeneous phases following a Maxwell construction of constant pressure and baryon number chemical potential across the transition, see [2] for a discussion. The two homogeneous phases are described within the framework of Constantinou et al [3]. The crust has been reconstructed in a thermodynamically consistent and unified way using the CUTER tool [2,4], see [2] for details.

References to the original work

- A. Akmal, V.R. Pandharipande and D.G. Ravenhall, Phys. Rev. C 58 (1998) 1804.
- 2. P.J. Davis et al, Eur. Phys. J. A (2025).
- C. Constantinou, B. Muccioli, M. Prakash, J.M. Lattimer, Phys. Rev. C89(6), 065802 (2014).
- 4. P.J. Davis, et al, Astron. Astrophys. 687, 44 (2024).

Nuclear Matter Properties¹

	Quantity	Unit		
n_S	saturation density in symmetric matter	fm^{-3}	0.16	
E_0	binding energy per baryon at saturation	MeV	16.0	
K	incompressibility	MeV	266.0	
K'	skewness	MeV	—	
J	symmetry energy	MeV	32.59	
L	symmetry energy slope parameter	MeV	58.47	
K_{sym}	symmetry incompressibility	MeV	-102.63	

Neutron Star Properties¹

	Quantity	Unit	
M _{max}	maximum mass	M_{sun}	2.19
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o μ^-	M_{sun}	_
$R_{M_{max}}$	radius at maximum NS mass	km	9.97
$R_{1.4}$	radius at $1.4 M_{sun} NS$ mass	km	11.49
$ ilde{\Lambda}$	tidal deformability for a NS with $M = 1.4 M_{sun}$	230	

eos.thermo

eos.
thermo and the three grid defining files are CompOSE standard data files and by definition available.

table dimension1table type1total number of grid points2295

¹0-values indicate, that the corresponding data is not provided.

Range and density (#) of the grid parameters:

	Quantity	Unit	\min	max	#	
Т	Temperature	MeV	0	0	1	
n_b	Baryon Nr Density	${\rm fm}^{-3}$	1.e-11	1.30	2295	
Y_q	Charge Fraction		0	0	1	

T, $\mathbf{n}_b,$ and \mathbf{Y}_q are stored in eos.t, eos.nb, and eos.yq, respectively.

Further Available Data Files

Files and quantities listed in the following are provided beyond CompOSE's core requirements as outlined in Sec.4.2. of the CompOSE manual.

eos.compo: available

index	particle
0	e
1	μ
10	n
11	р
1	information on average nucleus in the crust
	- end of table -

eos.micro : available

index	particle
10040	Neutron Landau effective mass m_n^L/m_n
11040	Proton Landau effective mass m_p^L/m_p
10050	Neutron non-relativistic single particle potential U_n
11050	Proton non-relativistic single particle potential U_p
	- end of table -