NL3

EoS Submission Details

EoS name	NL3
category	Hadronic
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Abstract

This table corresponds to the unified EoS of neutron star ($npe\mu$) matter at zero temperature and β-equilibrium [1], which is obtained in the framework of Thomas-Fermi approximation and assuming geometrical symmetries for the Wigner-Seitz cells [2]. The covariant density functional NL3 is adopted [3].

References to the original work

1. C.-J. Xia, T. Maruyama, A. Li, B. Y. Sun, W.-H. Long, and Y.-X. Zhang, Commun. Theor. Phys. 74, 095303 (2022).

2. C.-J. Xia, B. Y. Sun, T. Maruyama, W.-H. Long, and A. Li, Phys. Rev. C 105, 045803 (2022).

3. G. A. Lalazissis, J. König, and P. Ring, Phys. Rev. C 55, 540 (1997).

Nuclear Matter Properties[1]

	Quantity	Unit	
n_S	saturation density in symmetric matter	fm^{-3}	0.148
E_0	binding energy per baryon at saturation	MeV	16.25
K	incompressibility	MeV	271.7
K'	skewness	MeV	204
J	symmetry energy	MeV	37.4
L	symmetry energy slope parameter	MeV	118.6
K_{sym}	symmetry incompressibility	MeV	101

Neutron Star Properties[1]

	Quantity	Unit	
M_{max}	maximum mass	M_{sun}	2.77
$M_{DU,\mu}$	mass at DUrca threshold with μ^-	M_{sun}	1.01
$R_{M_{max}}$	radius at maximum NS mass	km	13.29
$R_{1.4}$	radius at 1.4 M_{sun} NS mass	km	14.59
$\tilde{\Lambda}$	tidal deformability for GW170817 at a mass ratio of $q = 0.8$		1482

eos.thermo

eos.thermo and the three grid defining files are CompOSE standard data files and by definition available. In eos.thermo, five extra quantities are added, i.e., d, Z, A, R_d, and R_{W}. The quantity d refers to the geometry of the correspondent pasta phase, represented by an integer, with 0 for the uniform phase, 1-slabs, 2-rods, 3-droplets, -2-tubs, and -3-bubbles. The quantities Z and A represent the total proton and nucleon number enclosed within the Wigner-Seitz (WS) cell (for $d = 1$, 2, and -2 a finite cell size $a = 30$ fm is adopted), while R_{d} represents the droplet size and R_{W} the WS cell size.

table dimension	1
table type	1
total number of grid points	1078

[1] 0-values indicate, that the corresponding data is not provided.

Range and density (#) of the grid parameters:

	Quantity	Unit	min	max	#
T	Temperature	MeV	0	0	1
n_b	Baryon Nr Density	fm^{-3}	7.58143×10^{-11}	2	1078
Y_q	Charge Fraction		0	0	1

T, n_b, and 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
10	n
11	p
0	e
1	μ
	- end of table -

eos.mr : This file provides the gravitational mass (in solar masses), the radius (in km), and the tidal deformability of a family of stars computed for this unified RMF EoS model.