NL3$\omega\rho$−L55

EoS Submission Details

EoS name	NL3$\omega\rho$−L55
category	Inner crust
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Abstract

This inner crust EoS, including nonspherical pasta phases, was calculated within a self-consistent Thomas-Fermi approach [1] for β-equilibrium matter at zero temperature. The EoS parameterisation used was the non-linear RMF NL3$\omega\rho$ model with a slope of the symmetry energy, L, equal to 55 MeV [2,3]. This inner crust EoS has been published in Ref. [1]. Matched to model BsK22 [4] for the description of the outer crust below $n_B = 2 \times 10^{-3}$ fm^{-3}.

References to the original work

1. F. Grill. H. Pais, C. Providência, I. Vidaña, and S. Avancini, Phys. Rev. C **9**0, 045803 (2014).

2. C. J. Horowitz and J. Piekarewicz, Phys. Rev. Lett. **8**6, 5647 (2001); Phys. Rev. C **6**4, 062802 (2001).

3. H. Pais and C. Providência, Phys. Rev. C **9**4, 015808 (2016).

4. J. M. Pearson, N. Chamel, A. Y. Potekhin, A. F. Fantina, C. Ducoin, A. K. Dutta, and S. Goriely, MNRAS 481, 2994 (2018); https://compose.obspm.fr/eos/210

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	-16.24
K	incompressibility	MeV	270
K'	skewness	MeV	198
J	symmetry energy	MeV	31.7
L	symmetry energy slope parameter	MeV	55
K_{sym}	symmetry incompressibility	MeV	-8

Neutron Star Properties[1]

	Quantity	Unit	
M_{max}	maximum mass	M_{sun}	2.752
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o μ^-	M_{sun}	0
$R_{M_{max}}$	radius at maximum NS mass	km	13.02
$R_{1.4}$	radius at 1.4 M_{sun} NS mass	km	13.76
$\tilde{\Lambda}$	tidal deformability for GW170817 at a mass ratio of $q = 0.8$	-	1050.84

eos.thermo

eos.thermo and the three grid defining files are CompOSE standard data files and by definition available. In eos.thermo, an extra quantity is added (last column). It refers to the geometry of the correspondent pasta phase, represented by an integer, with 0 for the outer crust, and 1 - droplets, 2 - rods, 3 - slabs, 4- tubes, 5- bubbles, and 6 corresponds to the core (homogeneous matter).

table dimension	1
table type	1
total number of grid points	298

Range and density (#) of the grid parameters:

	Quantity	Unit	min	max	#
T	Temperature	MeV	0	0	1
n_b	Baryon Nr Density	fm^{-3}	0.467962×10^{-9}	0.82×10^{-1}	298
Y_q	Charge Fraction		0	0	1

T, n_b, and Y_q are stored in eos.t, eos.nb, and eos.yq, respectively.

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

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.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 inner-crust–core RMF EoS model, with the BsK22 outer crust.

eos.compo : available
4 particle pairs (neutrons, protons, electrons, muons) and one quadruple for heavy nucleus.
Phase index # 0: outer crust
Phase index # 7: inner crust
Phase index # 6: homogeneous matter

eos.micro : not available