SPG(M4)

EoS Submission Details

EoS name	SPG(M4)
category	Inner crust
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Abstract

This crust EoS for β-equilibrium matter at zero temperature is constructed with a BSk22 outer crust [1] below $n_B = 2 \times 10^{-3}$ fm^{-3} and inner crust EoS calculated within a Compressible Liquid Drop approach [2] up to $n_B = 0.98 \times 10^{-1}$ fm^{-3}. The EoS parameterisation used was one of the density-dependent RMF models with the GDFM functional for the couplings [3] generated in a Bayesian analysis and that agrees with both astrophysical and nuclear constraints [4].

References to the original work

1. 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 .

2. G. Baym, H. A. Bethe and C. J. Pethick, Nuclear Physics A **1**75, 225 (1971).

3. P. Gogelein, E. N. E. van Dalen, C. Fuchs and H. Muther, Phys. Rev. C **77**, 025802 (2008).

4. L. Scurto, H. Pais and F. Gulminelli in preparation

Nuclear Matter Properties[1]

	Quantity	Unit	
n_S	saturation density in symmetric matter	fm^{-3}	0.162
E_0	binding energy per baryon at saturation	MeV	-15.8
K	incompressibility	MeV	246
K'	skewness	MeV	293
J	symmetry energy	MeV	30.9
L	symmetry energy slope parameter	MeV	40
K_{sym}	symmetry incompressibility	MeV	-111.8

Neutron Star Properties[1]

	Quantity	Unit	
M_{max}	maximum mass	$\mathrm{M_{sun}}$	2.35
M_{DU}	mass at DUrca threshold with μ^-	$\mathrm{M_{sun}}$	X
$R_{M_{max}}$	radius at maximum NS mass	km	11.26
$R_{1.4}$	radius at 1.4 $\mathrm{M_{sun}}$ NS mass	km	12.31
$\tilde{\Lambda}$	tidal deformability for GW170817 at a mass ratio of $q = 0.8$	-	757.32

eos.thermo

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

table dimension	1
table type	1
total number of grid points	375

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}	0.9772×10^{-1}	375
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. X indicates DUrca threshold is not reached before the maximum mass.

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 radius (in km), the gravitational mass (in solar masses), the adimensional tidal deformability and the central density (in fm^{-3}) 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

eos.micro : not available