Tsiopelas-Sedrakian-Oertel/DDLS(70)-Y

EoS Submission Details

EoS name	Tsiopelas-Sedrakian-Oertel
EoS short name	DDLS(70)-Y
category	Hadronic
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Abstract

This general-purpose hadronic EoS table, based on the work of Ref. [1], is generated by following the covariant density functional (CDF) approach. The high-density phase includes the full $J^P = 1/2^+$ baryon octet, in which the coupling constants of the baryons are density-dependent (DD), selected appropriately so that the slope of the symmetry energy is $L_{\rm sym} = 70$ MeV and the skewness equals $Q_{\rm sat} = 400$ MeV, using the DDLS family of parametrizations [2]. The extension to lower densities was done by matching to the low-density HS(DD2) model [3], which is developed through an improved nuclear statistical equilibrium among nucleons and nuclear clusters.

References to the original work

1. S. Tsiopelas, A. Sedrakian, M. Oertel, Eur. Phys. J. A **60**, 127 (2024).

Further References

2. J.-J. Li and A. Sedrakian, Astrophys. J. **957**, 41 (2023).

3. M. Hempel and J. Schaffner-Bielich, Nucl. Phys. A **837**, 210 (2010).

Nuclear Matter Properties[1]

	Quantity	Unit	
n_S	saturation density in symmetric matter	fm^{-3}	0.152
E_0	binding energy per baryon at saturation	MeV	16.14
K	incompressibility	MeV	251
K'	skewness	MeV	400
J	symmetry energy	MeV	34.00
L	symmetry energy slope parameter	MeV	70
K_{sym}	symmetry incompressibility	MeV	0

Neutron Star Properties[1]

	Quantity	Unit	
M_{max}	maximum mass	M_{sun}	1.98
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o μ^-	M_{sun}	0
$R_{M_{max}}$	radius at maximum NS mass	km	11.81
$R_{1.4}$	radius at 1.4 M_{sun} NS mass	km	13.48
$\tilde{\Lambda}$	tidal deformability for GW170817 at a mass ratio of $q = 0.8$		0

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

eos.thermo

eos.thermo and the three grid defining files are CompOSE standard data files and by definition available. *Explain here thermodynamic quantities you provide in eos.thermo which are not obligatory.*

table dimension	3
table type	1
total number of grid points	1472580

Range and density (#) of the grid parameters:

	Quantity	Unit	min	max	#
T	Temperature	MeV	1.00000000E-01	1.58489320E+02	81
n_b	Baryon Nr Density	fm^{-3}	9.99999999E-013	1.20226440E+00	303
Y_q	Charge Fraction		1.00000000E-02	6.00000000E-01	60

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
0	e^-
10	n
11	p
100	Λ
110	Σ^-
111	Σ^0
112	Σ^+
120	Ξ^-
121	Ξ^0
2001	$^2_1$H
3001	$^3_1$H
3002	$^3_2$He
4002	$^4_2$He
- end of table -	

One further set of quadruples for an average "heavy" nucleus has been defined.

index	particle
999	group of all other nuclei not listed above (averaged)
	- end of table -

eos.micro : available

index	quantity	particle
10041	Dirac effective mass divided by particle mass m_i^D/m_i	n
11041	Dirac effective mass divided by particle mass m_i^D/m_i	p
100041	Dirac effective mass divided by particle mass m_i^D/m_i	Λ
110041	Dirac effective mass divided by particle mass m_i^D/m_i	Σ^-
111041	Dirac effective mass divided by particle mass m_i^D/m_i	Σ^0
112041	Dirac effective mass divided by particle mass m_i^D/m_i	Σ^+
120041	Dirac effective mass divided by particle mass m_i^D/m_i	Ξ^-
121041	Dirac effective mass divided by particle mass m_i^D/m_i	Ξ^0
	- end of table -	