

# Tsiopelas-Sedrakian-Oertel/DDLS(50)-Y

## EoS Submission Details

EoS name	Tsiopelas-Sedrakian-Oertel
EoS short name	DDLS(50)-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  $L_{\text{sym}} = 50$  MeV and the skewness equals  $Q_{\text{sat}} = 400$  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<sup>1</sup>

	Quantity	Unit	
$n_S$	saturation density in symmetric matter	$\text{fm}^{-3}$	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	32.20
$L$	symmetry energy slope parameter	MeV	50
$K_{sym}$	symmetry incompressibility	MeV	0

## Neutron Star Properties<sup>1</sup>

	Quantity	Unit	
$M_{max}$	maximum mass	$M_{sun}$	2.00
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o $\mu^-$	$M_{sun}$	0
$R_{M_{max}}$	radius at maximum NS mass	km	11.80
$R_{1.4}$	radius at 1.4 $M_{sun}$ NS mass	km	13.15
$\tilde{\Lambda}$	tidal deformability for GW170817 at a mass ratio of $q = 0.8$		0

<sup>1</sup>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	$\text{fm}^{-3}$	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	$\Lambda$
110	$\Sigma^-$
111	$\Sigma^0$
112	$\Sigma^+$
120	$\Xi^-$
121	$\Xi^0$
2001	${}^2_1\text{H}$
3001	${}^3_1\text{H}$
3002	${}^3_2\text{He}$
4002	${}^4_2\text{He}$
- 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 $m_i^D/m_i$	$\Lambda$
110041	Dirac effective mass divided by particle mass $m_i^D/m_i$	$\Sigma^-$
111041	Dirac effective mass divided by particle mass $m_i^D/m_i$	$\Sigma^0$
112041	Dirac effective mass divided by particle mass $m_i^D/m_i$	$\Sigma^+$
120041	Dirac effective mass divided by particle mass $m_i^D/m_i$	$\Xi^-$
121041	Dirac effective mass divided by particle mass $m_i^D/m_i$	$\Xi^0$
- end of table -		