

# DD-LZ1

## EoS Submission Details

EoS name	DD-LZ1
category	Hadronic
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## Abstract

This table corresponds to the unified EoS of neutron star ( $npe\mu$ ) matter at zero temperature and  $\beta$ -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 DD-LZ1 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. B. Wei, Q. Zhao, Z.-H. Wang, J. Geng, B.-Y. Sun, Y.-F. Niu, and W.-H. Long, Chin. Phys. C 44, 074107 (2020).

## Nuclear Matter Properties<sup>1</sup>

	Quantity	Unit	
$n_S$	saturation density in symmetric matter	$\text{fm}^{-3}$	0.158
$E_0$	binding energy per baryon at saturation	MeV	16.06
$K$	incompressibility	MeV	230.7
$K'$	skewness	MeV	1330
$J$	symmetry energy	MeV	32.0
$L$	symmetry energy slope parameter	MeV	42.5
$K_{sym}$	symmetry incompressibility	MeV	-20

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

	Quantity	Unit	
$M_{max}$	maximum mass	$M_{sun}$	2.56
$M_{DU,\mu}$	mass at DUrca threshold with $\mu^-$	$M_{sun}$	-
$R_{M_{max}}$	radius at maximum NS mass	km	12.29
$R_{1.4}$	radius at 1.4 $M_{sun}$ NS mass	km	13.15
$\tilde{\Lambda}$	tidal deformability for GW170817 at a mass ratio of $q = 0.8$		817.8

## 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

<sup>1</sup>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	$\text{fm}^{-3}$	$7.58143 \times 10^{-11}$	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	$\mu$
- 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.