

BHF calculation with chiral forces with crust EoS

EoS Submission Details

EoS name	BHF calculation with chiral forces with crust EoS
category	Hadronic
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Abstract

Microscopic equation of state (EoS) of dense β -stable nuclear matter at zero temperature ($T=0$) obtained using realistic two-body and three-body nuclear interactions derived in the framework of chiral perturbation theory (ChPT) and including the $\Delta(1232)$ isobar intermediate state. This EoS has been derived using the Brueckner-Bethe-Goldstone quantum many-body theory in the Brueckner-Hartree-Fock approximation with the continuous choice for the auxiliary single particle potential.

The present table is relative to the nuclear interaction model denoted as N3LO Δ + N2LO Δ 1 in Ref. [1]. It contains the contributions from electrons and muons in addition to β -stable nuclear matter. The above core EoS has been matched in a consistent way to a crust model from [2].

References to the original work

1. I. Bombaci and D. Logoteta, *Astron. and Astrophys.* 609. A128 (2018)
2. T. Carreau, F. Gulminelli, J. Margueron, *Eur.Phys.J.A* 55 (2019), 188.

Nuclear Matter Properties¹

	Quantity	Unit	
n_S	saturation density in symmetric matter	fm^{-3}	0.171
E_0	binding energy per baryon at saturation	MeV	15.23
K	incompressibility	MeV	190
K'	skewness	MeV	0
J	symmetry energy	MeV	35.39
L	symmetry energy slope parameter	MeV	76
K_{sym}	symmetry incompressibility	MeV	0

Neutron Star Properties¹

	Quantity	Unit	
M_{max}	maximum mass	M_{sun}	2.08
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o μ^-	M_{sun}	0.961
$R_{M_{max}}$	radius at maximum NS mass	km	10.26
$R_{1.4}$	radius at 1.4 M_{sun} NS mass	km	12.27
$\tilde{\Lambda}$	tidal deformability GW170817 at $q = M_1/M_2 = 0.8$		

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 1547
```

Range and density (#) of the grid parameters:

	Quantity	Unit	min	max	#
T	Temperature	MeV	0	0	1
n_b	Baryon Nr Density	fm^{-3}	1.E-11	1.2943	1547
Y_q	Charge Fraction		0.	0.	1

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

¹0-values indicate, that the corresponding data is not provided.