

BHF calculation with chiral forces

EoS Submission Details

EoS name	BHF calculation with chiral forces
category	Hadronic
submitted by	Ignazio Bombaci
affiliation	Pisa University, Italy
e-mail contact	ignazio.bombaci@unipi.it
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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. Neutron star properties have been obtained adding the Negele-Vautherin and Baym-Pethick-Sutherland EoS for the crust.

References to the original work

1. I. Bombaci and D. Logoteta, *Astron. and Astrophys.* 609. A128 (2018)

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	12.31
$\tilde{\Lambda}$	tidal deformability GW170817 at $q = M_1/M_2 = 0.8$		466

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 214

Range and density (#) of the grid parameters:

	Quantity	Unit	min	max	#
T	Temperature	MeV	0	0	1
n_b	Baryon Nr Density	fm^{-3}	0.08	1.2943	214
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.

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
1	μ
10	n
11	p
	- end of table -