ABHT(QMC-RMF1) with unified crust

EoS Submission Details

EoS name	ABHT(QMC-RMF1) with unified crust
category	Hadronic
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Abstract

This equation of state is a variant of the ABHT(QMC-RMF1) one (`https://compose.obspm.fr/eos/275`) with a crust reconstructed consistently with the CUTER tool [1,2], for details see [2]. The core EoS is composed of homogeneous n, p, e-matter. It is computed using a relativistic mean-field theory constrained by chiral effective field theory calculations of pure neutron matter (from 0.08 fm^3 to 0.32 fm^3) and by properties of isospin-symmetric nuclear matter around saturation density [3].

References to the original work

1. P.J. Davis *et al*, Eur. Phys. J. A (2025).
2. P.J. Davis, *et al*, Astron. Astrophys. 687, 44 (2024).
3. M. G. Alford, L. Brodie, A. Haber, and I. Tews, Phys. Rev. C 106, 055804 (2022).

Nuclear Matter Properties[1]

	Quantity	Unit	
n_S	saturation density in symmetric matter	fm^{-3}	0.16
E_0	binding energy per baryon at saturation	MeV	16.1
K	incompressibility	MeV	260.0
K'	skewness	MeV	496.0
J	symmetry energy	MeV	32.9
L	symmetry energy slope parameter	MeV	44.5
K_{sym}	symmetry incompressibility	MeV	-191.0

Neutron Star Properties[1]

	Quantity	Unit	
M_{max}	maximum mass	M_{sun}	1.95
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o μ^-	M_{sun}	-
$R_{M_{max}}$	radius at maximum NS mass	km	10.22
$R_{1.4}$	radius at 1.4 M_{sun} NS mass	km	11.76
$\tilde{\Lambda}$	tidal deformability for a 1.4 M_{sun} NS	308	

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	1876

[1] 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	fm^{-3}	1.e-11	1.29	1876
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
0	e
10	n
11	p
1	information on average nucleus in the crust
	- end of table -

eos.micro : available

index	particle
10041	Neutron Dirac effective mass m_n^D/m_n
11041	Proton Dirac effective mass m_p^D/m_p
10051	Neutron relavistic vector self-energy V_n
11051	Proton relavistic vector self-energy V_p
10052	Neutron relavistic scalar self-energy S_n
11052	Proton relavistic scalar self-energy S_p
	- end of table -