FYSS EoS with full nuclear distribution and RMF

EoS Submission Details

EoS name	FYSS EoS with full nuclear distribution and RMF
category	nuclear
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Abstract

In the present equation of state, the relativistic mean field theory with the TM1 parameter set for nucleons has been adopted, the quantum approach for d, t, h and α, as well as the liquid drop model for the other nuclei under the assumption of nuclear statistical equilibrium. Temperature dependences of surface and shell energies of heavy nuclei have been taken into account as well as the possibility of pasta phases for heavy nuclei and the Pauli- and self-energy shifts for d, t, h and α. Further details can be found in Refs. [1-3]. The present version of the table does not contain contributions from leptons and photons.

References to the original work

1. Shun Furusawa, Kohsuke Sumiyoshi, Shoichi Yamada & Hideyuki Suzuki: *Supernova equations of state including full nuclear ensemble with in-medium effects*, Nuclear Physics A 957, 188 (2017)

2. S. Furusawa, K. Sumiyoshi, S. Yamada, and H. Suzuki, Astrophys. J. 772, 95 (2013).

3. S. Furusawa, S. Yamada, K. Sumiyoshi, and H. Suzuki, Astrophys. J. 738, 178 (2011).

Further References

4. Shun Furusawa, Hiroki Nagakura, Kohsuke Sumiyoshi, Chinami Kato, Shoichi Yamada, Phys. Rev. C 95, 025809 (2017).

Nuclear Matter Properties[1]

	Quantity	Unit	
n_S	saturation density in symmetric matter	fm^{-3}	0.145
E_0	binding energy per baryon at saturation	MeV	16.27
K	incompressibility	MeV	274
K'	skewness	MeV	446
J	symmetry energy	MeV	36.9
L	symmetry energy slope parameter	MeV	110
K_{sym}	symmetry incompressibility	MeV	166

Neutron Star Properties[1]

	Quantity	Unit	
M_{max}	maximum mass	M$_{sun}$	2.22
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o μ^-	M$_{sun}$	0
$R_{M_{max}}$	radius at maximum NS mass	km	12.7
$R_{1.4}$	radius at 1.4 M$_{sun}$ NS mass	km	14.4

eos.thermo

eos.thermo and the three grid defining files are CompOSE standard data files and by definition available. eos.thermo does <u>not</u> necessarily provide all possible data.

table dimension	3
table type	1
total number of grid points	644735

Range and density (#) of the grid parameters:

	Quantity	Unit	min	max	#
T	Temperature	MeV	0.1	398.1072	91
n_b	Baryon Nr Density	fm^{-3}	9.54E-11	6.02	109
Y_q	Charge Fraction		0.01	0.65	65

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

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[1] 0-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
10	n
11	p
2001	^{2}H
3001	^{3}H
3002	^{3}He
4002	α-particle
	- end of table -

further particle sets are defined as quadrupels representing an average heavy nucleus ($Z > 5$) and average light nuclei ($Z < 6$).

index	description
1	Average mass number, proton number and fraction for heavy nuclei ($Z > 5$)
2	Average mass number, proton number and fraction for light nuclei ($Z < 6$)
	- end of table -

eos.micro : available

index	quantity	particle
10041	Landau effective mass divided by particle mass m_i^L/m_i	n
11041	Landau effective mass divided by particle mass m_i^L/m_i	p
	- end of table -	