

STOSY30

EoS Submission Details

EoS name	STOSY30
category	hadronic
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Abstract

This table contains the EoS of C. Ishizuka et al. [1]. It is an extension of the EoS by H. Shen, F. Yang, H. Toki, K. Oyamatsu, and K. Sumiyoshi [2,3] including hyperons using a non-linear relativistic mean-field model with the TM1 parametrization [4] of the effective nuclear interaction. Hyperonic couplings are fixed by $SU(3)$ -symmetry and the single particle potentials in nuclear matter at saturation density. This is the version with $U_{\Sigma N} = 30$ MeV. Non-uniform nuclear matter is calculated in the single-nucleus Thomas-Fermi approximation with parametrized density distributions in spherical Wigner-Seitz cells. Only neutrons, protons, α particles and a single heavy nucleus are considered. The present table was taken from the website <http://aspht1.ph.noda.tus.ac.jp/ishizuka/readme.html> of C. Ishizuka.

References to the original work

1. C. Ishizuka, A. Ohnishi, K. Tsubakihara, K. Sumiyoshi, S. Yamada, Journ. of Phys. G 35 (2008) 085201.
2. H. Shen, H. Toki, K. Oyamatsu, K. Sumiyoshi, Prog. Theor. Phys. 100 (1998) 1013
3. H. Shen, H. Toki, K. Oyamatsu, K. Sumiyoshi, Nucl. Phys. A 637 (1998) 435

Further References

4. Y. Sugahara, H. Toki, Nucl. Phys. A 579 (1994) 557
5. K. Sumiyoshi, C. Ishizuka, A. Ohnishi, S. Yamada, H. Suzuki, Astrophys.J. 690 (2009) L43

Nuclear Matter Properties¹

	Quantity	Unit	
n_S	saturation density in symmetric matter	fm^{-3}	0.145
E_0	binding energy per baryon at saturation	MeV	16.3
K	incompressibility	MeV	281
K'	skewness	MeV	-285
J	symmetry energy	MeV	36.9
L	symmetry energy slope parameter	MeV	110.8
K_{sym}	symmetry incompressibility	MeV	33.6

Neutron Star Properties¹

	Quantity	Unit	
M_{max}	maximum mass	M_{sun}	1.64
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o μ^-	M_{sun}	0
$R_{M_{max}}$	radius at maximum NS mass	km	13.5
$R_{1.4}$	radius at 1.4 M_{sun} NS mass	km	14.3

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

eos.thermo

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

table dimension 3
table type 3
total number of grid points 340288

Range and density (#) of the grid parameters:

	Quantity	Unit	min	max	#
T	Temperature	MeV	0.00000000E+00	0.10000000E+03	32
n_b	Baryon Nr Density	fm^{-3}	0.75814210E-10	0.15126935E+01	104
Y_q	Charge Fraction		0.00000000E-00	0.56230000E+00	72

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

additional quantities in eos.thermo

none defined

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
100	Λ
110	Σ^-
111	Σ^0
112	Σ^+
120	Ξ^-
121	Ξ^0
4002	${}^4_2\text{He}$
0	e^-
	- end of table -

Further particle sets are defined. One set of quadruples for an average heavy nucleus. See Table 7.2 of the CompOSE manual.

eos.micro : available

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

Description of Phases

A nonzero hyperon fraction is indicated by a value of 1 for the phase flag. Otherwise it is 0.