

# STOSY $\pi$ 90

## EoS Submission Details

EoS name	STOSY $\pi$ 90
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 and pions 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  $U_{\Sigma N} = 90$  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,  $\alpha$  particles and a single heavy nucleus are considered. The present table was taken from the website <http://asph1.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 Properties<sup>1</sup>

	Quantity	Unit	
$n_S$	saturation density in symmetric matter	$\text{fm}^{-3}$	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 Properties<sup>1</sup>

	Quantity	Unit	
$M_{max}$	maximum mass	$M_{\text{sun}}$	1.66
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o $\mu^-$	$M_{\text{sun}}$	0
$R_{M_{max}}$	radius at maximum NS mass	km	12.7
$R_{1.4}$	radius at 1.4 $M_{\text{sun}}$ NS mass	km	13.6

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<sup>1</sup>0-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	$\text{fm}^{-3}$	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	$\Lambda$
110	$\Sigma^-$
111	$\Sigma^0$
112	$\Sigma^+$
120	$\Xi^-$
121	$\Xi^0$
320	$\pi^-$
321	$\pi^0$
322	$\pi^+$
4002	${}^4_2\text{He}$
0	$e^-$

- continued on next page -

index		quantity
		- 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.