

STOSYA30

EoS Submission Details

| | |
|---------------------|---|
| EoS name | STOSYA30 |
| category | hadronic |
| submitted by | Micaela Oertel |
| affiliation | LUTH, CNRS/Observatoire de Paris/Université Paris Diderot |
| e-mail contact | micaela.oertel@obspm.fr |
| sheet creation date | May 19, 2015 |

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://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 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} | 1.63 |
| $M_{DU,e}$ | mass at DUrca threshold (1/9) w/o μ^- | M_{sun} | 0 |
| $R_{M_{max}}$ | radius at maximum NS mass | km | 13.6 |
| $R_{1.4}$ | 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.