

DDME2

EoS Submission Details

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|---------------------|------------------------------|
| EoS name | DDME2 |
| category | Inner crust-core unified EoS |
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Abstract

This inner crust-core unified EoS for β -equilibrium matter at zero temperature is constructed with a BsK22 outer crust [1] below $n_B = 2 \times 10^{-3} \text{ fm}^{-3}$, an inner crust EoS, including nonspherical pasta phases, calculated within a self-consistent Thomas-Fermi approach [2], and a homogeneous $npe\mu$ core EoS, above $n_B = 0.72 \times 10^{-1} \text{ fm}^{-3}$. The EoS parameterisation used was the density-dependent RMF DDME2 model [3].

References to the original work

1. J. M. Pearson, N. Chamel, A. Y. Potekhin, A. F. Fantina, C. Ducoin, A. K. Dutta, and S. Goriely, MNRAS 481, 2994 (2018); <https://compose.obspm.fr/eos/210> .
2. F. Grill. H. Pais, C. Providência, I. Vidaña, and S. Avancini, Phys. Rev. C **90**, 045803 (2014).
3. G. A. Lalazissis, T. Niksić, D. Vretenar, and P. Ring, Phys. Rev. C **71**, 024312 (2005).

Nuclear Matter Properties¹

| | Quantity | Unit | |
|-----------|---|------------------|--------|
| n_S | saturation density in symmetric matter | fm^{-3} | 0.152 |
| E_0 | binding energy per baryon at saturation | MeV | -16.14 |
| K | incompressibility | MeV | 251 |
| K' | skewness | MeV | 479 |
| J | symmetry energy | MeV | 32.3 |
| L | symmetry energy slope parameter | MeV | 51 |
| K_{sym} | symmetry incompressibility | MeV | -87.2 |

Neutron Star Properties¹

| | Quantity | Unit | |
|-------------------|---|------------------|--------|
| M_{max} | maximum mass | M_{sun} | 2.48 |
| $M_{DU,e}$ | mass at DUrca threshold (1/9) w/o μ^- | M_{sun} | 0 |
| $R_{M_{max}}$ | radius at maximum NS mass | km | 12.15 |
| $R_{1.4}$ | radius at 1.4 M_{sun} NS mass | km | 13.23 |
| $\tilde{\Lambda}$ | tidal deformability for GW170817 at a mass ratio of $q = 0.8$ | - | 802.46 |

eos.thermo

eos.thermo and the three grid defining files are CompOSE standard data files and by definition available. In eos.thermo, an extra quantity is added (last column). It refers to the geometry of the correspondent pasta phase, represented by an integer, with 0 for the outer crust, and 1 - droplets, 2 - rods, 3 - slabs, 4- tubes, 5- bubbles, and 6 corresponds to the core (homogeneous matter).

```
table dimension      1
table type           1
total number of grid points 415
```

Range and density (#) of the grid parameters:

| | Quantity | Unit | min | max | # |
|-------|-------------------|------------------|---------------------------|--------|-----|
| T | Temperature | MeV | 0 | 0 | 1 |
| n_b | Baryon Nr Density | fm^{-3} | 0.467962×10^{-9} | 1.3104 | 415 |
| Y_q | Charge Fraction | | 0 | 0 | 1 |

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

¹0-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.mr : This file provides the gravitational mass (in solar masses), the radius (in km), and the tidal deformability of a family of stars computed for this unified inner-crust-core RMF EoS model, with the BsK22 outer crust.

eos.compo : available
4 particle pairs (neutrons, protons, electrons, muons) and one quadruple for heavy nucleus.

Phase index # 0: outer crust

Phase index # 7: inner crust

Phase index # 6: homogeneous matter

eos.micro : not available