

Hybrid EoS DD2-FRG with vector interactions (2+1 flavors)

EoS Submission Details

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|---------------------|---|
| EoS name | Hybrid EoS DD2-FRG with vector interactions (2+1 flavors) |
| category | Hybrid |
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| sheet creation date | April 8, 2021 |

Abstract

The present hybrid EoS is constructed from the HS(DD2) EoS for hadronic matter [1,2] and quark matter is described by a non-perturbative functional renormalization group approach within a 2+1 flavor quark-meson truncation in the local potential approximation (LPA) [3] including vector interactions [4] with $g_v = 1$.

References to the original work

1. M. Hempel and J. Schaffner-Bielich, Nucl. Phys. A 837 (2010) 210.
2. S. Typel, G. Röpke, T. Klähn, D. Blaschke, and H.H. Wolter, Phys. Rev. C 81 (2010) 015803.
3. K. Otto, M. Oertel, B-J. Schaefer, Phys. Rev. D 101 (2020) 103021.
4. K. Otto, M. Oertel, B-J. Schaefer, Eur.Phys.J.ST 229 (2020) 3629.

Nuclear Matter Properties¹

| | Quantity | Unit | |
|-----------|---|------------------|-------|
| n_S | saturation density in symmetric matter | fm^{-3} | 0.149 |
| E_0 | binding energy per baryon at saturation | MeV | 16.02 |
| K | incompressibility | MeV | 243 |
| K' | skewness | MeV | 169 |
| J | symmetry energy | MeV | 31.7 |
| L | symmetry energy slope parameter | MeV | 55 |
| K_{sym} | symmetry incompressibility | MeV | 0 |

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

Neutron Star Properties¹

| | Quantity | Unit | |
|-------------------|---|------------------|------|
| M_{max} | maximum mass | M_{sun} | 1.96 |
| $M_{DU,e}$ | mass at DUrca threshold (1/9) w/o μ^- | M_{sun} | 0 |
| $R_{M_{max}}$ | radius at maximum NS mass | km | 13.0 |
| $R_{1.4}$ | radius at 1.4 M_{sun} NS mass | km | 13.2 |
| $\tilde{\Lambda}$ | tidal deformability GW170817 at $q = M_1/M_2 = 0.8$ | | 795 |

eos.thermo

eos.thermo and the three grid defining files are ComPOSE standard data files and by definition available.

```
table dimension      1
table type          1
total number of grid points 234
```

Range and density (#) of the grid parameters:

| | Quantity | Unit | min | max | # |
|-------|-------------------|------------------|---------|------|-----|
| T | Temperature | MeV | 0 | 0 | 1 |
| n_b | Baryon Nr Density | fm^{-3} | 6.9E-10 | 1.08 | 234 |
| Y_q | Charge Fraction | | 0 | 0 | 1 |

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