R(DD2YΔ) $x_{\sigma\Delta} = 1.1$; $x_{\omega\Delta} = 1.1$; $x_{\rho\Delta} = 1.0$;

EoS Submission Details

EoS name	R(DD2YΔ) $x_{\sigma\Delta} = 1.1$; $x_{\omega\Delta} = 1.1$; $x_{\rho\Delta} = 1.0$;
category	Hadronic
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sheet creation date	January 23, 2022

Abstract

This hadronic EOS table accounts for hyperons and Δ(1232) resonances in addition to nucleons [1,2]. The nucleonic RMF effective interaction is DD2 [3]. The coupling constants of exotic species to different mesonic fields are provided in the table nearby. For the clusterized phase occurring at sub-saturation densities we use data in HS(DD2) available on CompOSE; they have been obtained within a statistical model with excluded volume and interactions [4]. The transition from unhomogeneous matter to homogeneous matter is done by minimizing the free energy density. For the masses of nuclei, FRDM [5] was used.

References to the original work

1. Ad. R. Raduta *et al.*, in preparation (2022).

2. Ad. R. Raduta, M. Oertel, A. Sedrakian, MNRAS 499 (2020) 914-931.

3. S. Typel, G. Ropke, T. Klahn, D. Blaschke, and H.H. Wolter, Phys. Rev. C 81 (2010) 015803.

4. M. Hempel and J. Schaffner-Bielich, Nucl. Phys. A 837 (2010) 210.

5. P. Moller, J.R. Nix, and K.-L. Kratz, Atomic Data and Nuclear Data Tables 66 (1997) 131.

Coupling constants of exotic species to meson fields

expressed in terms of the coupling constants of the nucleons N to the meson fields, $x_{mB} = g_{mB}/g_{mN}$.

coupling constant	value
$x_{\sigma\Lambda}$	0.6154
$x_{\sigma\Xi}$	0.3259
$x_{\sigma\Sigma}$	0.4740
$x_{\sigma\Delta}$	1.1000
$x_{\omega\Lambda}$	2/3
$x_{\omega\Xi}$	1/3
$x_{\omega\Sigma}$	2/3
$x_{\omega\Delta}$	1.1000
$x_{\rho\Lambda}$	0
$x_{\rho\Xi}$	1
$x_{\rho\Sigma}$	2
$x_{\rho\Delta}$	1
$x_{\phi\Lambda}$	$-\sqrt{2}/3$
$x_{\phi\Xi}$	$-\sqrt{2}/3$
$x_{\phi\Sigma}$	$-2\sqrt{2}/3$
$x_{\phi\Delta}$	0
	- end of table -

Nuclear Matter Properties[1]

	Quantity	Unit	
n_S	saturation density in symmetric matter	fm^{-3}	0.1491
E_0	binding energy per baryon at saturation	MeV	16.02
K	incompressibility	MeV	242.7
K'	skewness	MeV	168.7
J	symmetry energy	MeV	31.67
L	symmetry energy slope parameter	MeV	55.03
K_{sym}	symmetry incompressibility	MeV	-93.23

Neutron Star Properties[1]

	Quantity	Unit	
M_{max}	maximum mass	M_{sun}	2.038
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o μ^-	M_{sun}	0.99
$R_{M_{max}}$	radius at maximum NS mass	km	11.21
$R_{1.4}$	radius at 1.4 M_{sun} NS mass	km	12.97
$\tilde{\Lambda}$	tidal deformability for GW170817 at a mass ratio of $q = 0.8$		670

eos.thermo

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

additional quantities in eos.thermo

none defined

table dimension	3
table type	1
total number of grid points	1377120

[1] 0-values indicate, that the corresponding data is not provided.

Range and density (#) of the grid parameters:

	Quantity	Unit	min	max	#
T	Temperature	MeV	0.1 MeV	100 MeV	76
n_b	Baryon Nr Density	fm^{-3}	10^{-12} fm^{-3}	1.0964782 fm^{-3}	302
Y_q	Charge Fraction		0.01	0.6	60

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

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
20	Δ^-
21	Δ^0
22	Δ^+
23	Δ^{++}
100	Λ
110	Σ^-
111	Σ^0
112	Σ^+
120	Ξ^-
121	Ξ^0
4002	${}^4_2He$
3002	${}^3_2He$
3001	${}^3_1H$
2001	${}^2_1H$
	- end of table -

further particle sets are defined. One set of quadruples for an average "heavy" nucleus, see Table 7.2 of the manual.

index	particle
999	group of all other nuclei which are not listed above (averaged)
	- end of table -

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
20041	Dirac effective mass divided by particle mass m_i^D/m_i	Δ^-
21041	Dirac effective mass divided by particle mass m_i^D/m_i	Δ^0
22041	Dirac effective mass divided by particle mass m_i^D/m_i	Δ^+
23041	Dirac effective mass divided by particle mass m_i^D/m_i	Δ^{++}
100041	Dirac effective mass divided by particle mass m_i^D/m_i	Λ
110041	Dirac effective mass divided by particle mass m_i^D/m_i	Σ^-
111041	Dirac effective mass divided by particle mass m_i^D/m_i	Σ^0
112041	Dirac effective mass divided by particle mass m_i^D/m_i	Σ^+
120041	Dirac effective mass divided by particle mass m_i^D/m_i	Ξ^-
121041	Dirac effective mass divided by particle mass m_i^D/m_i	Ξ^0
	- end of table -	

Description of Phases

Fill this part briefly, in particular if several phases occur. In this latter case characterize the transition(s).

PHASE INDEX #1:

NSE phase, i.e., a mixture of nuclei and baryons

PHASE INDEX #3:

homogeneous matter

PHASE INDEX #2:

Maxwell transition region between phase 1 and 3, assuming local charge neutrality and locally fixed Y_e .