

R(DD2Y Δ) $x_{\sigma\Delta} = 1.2$; $x_{\omega\Delta} = 1.3$; $x_{\rho\Delta} = 1.0$;

EoS Submission Details

EoS name	R(DD2Y Δ) $x_{\sigma\Delta} = 1.2$; $x_{\omega\Delta} = 1.3$; $x_{\rho\Delta} = 1.0$;
category	Hadronic
submitted by	Adriana R. Raduta
affiliation	IFIN-HH Bucharest
e-mail contact	adriana.raduta@nipne.ro
sheet creation date	February 8, 2022

Abstract

This hadronic EOS table accounts for hyperons and $\Delta(1232)$ 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 densities below $n_B = 0.08 \text{ fm}^{-3}$ we have used the crust EoS of [4] corresponding to DM1 Gogny interaction.

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. X. Vinas, C. Gonzalez-Boquera, M. Centelles, C. Mondal and L. M. Robledo, Symmetry 13 (2021) 1613.

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
$x_{\sigma\Sigma}$	0.3259
$x_{\sigma\Delta}$	0.4740
$x_{\omega\Lambda}$	1.2000
$x_{\omega\Sigma}$	2/3
$x_{\omega\Delta}$	1/3
$x_{\rho\Lambda}$	2/3
$x_{\rho\Sigma}$	1.3000
$x_{\rho\Delta}$	0
$x_{\phi\Lambda}$	1
$x_{\phi\Sigma}$	2
$x_{\phi\Delta}$	1
$x_{\sigma\Lambda}$	$-\sqrt{2}/3$
$x_{\sigma\Sigma}$	$-\sqrt{2}/3$
$x_{\sigma\Delta}$	$-2\sqrt{2}/3$
$x_{\omega\Lambda}$	0
$x_{\omega\Sigma}$	- end of table -
$x_{\omega\Delta}$	

Nuclear Matter Properties¹

	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 Properties¹

	Quantity	Unit	
M_{max}	maximum mass	M_{sun}	2.032
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o μ^-	M_{sun}	1.60
$R_{M_{max}}$	radius at maximum NS mass	km	11.45
$R_{1.4}$	radius at 1.4 M_{sun} NS mass	km	13.26
$\tilde{\Lambda}$	tidal deformability for GW170817 at a mass ratio of $q = 0.8$		771

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	1
table type	1
total number of grid points	1792

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

Range and density (#) of the grid parameters:

	Quantity	Unit	min	max	#
T	Temperature	MeV	0	0	1
n_b	Baryon Nr Density	fm^{-3}	$6.8 \cdot 10^{-13} \text{ fm}^{-3}$	1.2 fm^{-3}	1792
Y_q	Charge Fraction		0	0	1

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
0	e
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	${}^4_2\text{He}$
3002	${}^3_2\text{He}$
3001	${}^3_1\text{H}$
2001	${}^2_1\text{H}$
	- end of table -

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

index	particle
999	the heavy nucleus in the crust
	- end of table -

eos.micro: not available

eos.mr: available

This file provides the gravitational and baryonic masses (in solar masses), the radius (in km), the tidal deformability and the central baryonic number density (in fm^{-3}) of a family of stars computed for this EoS model.

Description of Phases

Fill this part briefly, in particular if several phases occur.

PHASE INDEX #1:

outer crust

PHASE INDEX #2:

inner crust

PHASE INDEX #3:

homogeneous matter in the core