

VGBCMR(D1M)

EoS Submission Details

EoS name	VGBCMR(D1M)
category	Hadronic
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Abstract

This EoS table corresponds to the data and model in [1,2]. The Gogny D1M effective interaction [3] is used. The EoS in the inner crust is obtained with the Wigner-Seitz approximation in the Variational Wigner-Kirkwood approach along with the Strutinsky integral method, which allows one to estimate in a perturbative way the proton shell and pairing corrections. For the outer crust, the EoS is determined basically by the nuclear masses, which are taken from the experiments, wherever they are available, or by HFB calculations performed with this new force if the experimental masses are not known. The leptonic sector accounts for electrons and muons.

References to the original work

1. C. Mondal, X. Vinas, M. Centelles and J. N. De, Phys. Rev. C 102 (2020) 015802.
2. X. Vinas, C. Gonzalez-Boquera, M. Centelles, C. Mondal and L. M. Robledo, Symmetry 13 (2021) 1613
3. C. Gonzalez-Boquera, M. Centelles, X. Vinas, L. M. Robledo, Phys. Lett. B 779 (2018) 195.

Nuclear Matter Properties¹

	Quantity	Unit	
n_S	saturation density in symmetric matter	fm^{-3}	0.1647
E_0	binding energy per baryon at saturation	MeV	16.02
K	incompressibility	MeV	225.0
K'	skewness	MeV	0
J	symmetry energy	MeV	28.55
L	symmetry energy slope parameter	MeV	24.83
K_{sym}	symmetry incompressibility	MeV	0

Neutron Star Properties¹

	Quantity	Unit	
M_{max}	maximum mass	M_{sun}	1.735
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o μ^-	M_{sun}	not allowed
$R_{M_{max}}$	radius at maximum NS mass	km	9.155
$R_{1.4}$	radius at 1.4 M_{sun} NS mass	km	10.21
$\tilde{\Lambda}$	tidal deformability for GW170817 at a mass ratio of $q = 0.8$		147

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	2222

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}	$6.8 \cdot 10^{-13} \text{ fm}^{-3}$	1.4 fm^{-3}	2222
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
1	μ
10	n
11	p
	- 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