Quark-Meson-Coupling Model

EoS Submission Details

EoS name	Quark-Meson-Coupling Model
EoS short name	QMC-A
category	Hadronic/quark/hybrid....
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Abstract

The EOS are based on the QMC model first proposed in Ref.[1]. In this model the quark structure to the hadron is modified by the surrounding fields created by the medium. This response of the structure to the medium generates many body effects, among which a repulsive 3-body force which is at the origin of the nuclear saturation. The introduction of strangeness introduces no new parameters because the model is based on the quark structure. See Ref.[2] for a review of the theoretical fundations and applications of the model to finite nuclei structure and high density nuclear matter. The finite temperature EOS are computed in the self consistent Hartree Fock approximation and first results for hot matter can be found in Ref.[3]. The current version has been updated in a minor technical way since publication of Ref.[3], leading to a slight change in model parameters. These changes do not affect physical results. The present table contains the hadronic contribution only.

References to the original work

1. P.A.M. Guichon, *A Possible Quark Mechanism for the Saturation of Nuclear Matter*, Phys.Lett.B200 (1988) 235-240

2. P.A.M. Guichon, J.R. Stone, A.W. Thomas, *Quark–Meson-Coupling (QMC) model for finite nuclei, nuclear matter and beyond*, Prog.Part.Nucl.Phys. 100 (2018) 262-297

3. J.R. Stone, V. Dexheimer, P.A.M. Guichon, A.W. Thomas, S. Typel, *Equation of state of hot dense hyperonic matter in the Quark–Meson-Coupling (QMC-A) model* Mon.Not.Roy.Astron.Soc. 502 (2021) 3, 3476-3490

Nuclear Matter Properties[1]

	Quantity	Unit	
n_S	saturation density in symmetric matter	fm^{-3}	0.14500
E_0	binding energy per baryon at saturation	MeV	15.993
K	incompressibility	MeV	290.13
K'	skewness	MeV	0
J	symmetry energy	MeV	28.987
L	symmetry energy slope parameter	MeV	47.028
K_{sym}	symmetry incompressibility	MeV	0
U_Λ	Λ-potential at saturation	MeV	- 30
U_Σ	Σ-potential at saturation	MeV	-2.6
U_Ξ	Ξ-potential at saturation	MeV	-13.6

Neutron Star Properties[1]

	Quantity	Unit	
M_{max}	maximum mass	M_{sun}	2.08
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o μ^-	M_{sun}	0
$R_{M_{max}}$	radius at maximum NS mass	km	12.10
$R_{1.4}$	radius at 1.4 M_{sun} NS mass	km	12.99

eos.thermo

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

table dimension	3
table type	1
total number of grid points	7800

[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	120	13
n_b	Baryon Nr Density	fm^{-3}	0.01	1.2	120
Y_q	Charge Fraction		0.1	0.5	5

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
11	p
10	n
100	Λ
112	Σ^+
111	Σ^0
110	Σ^-
121	Ξ^0
120	Ξ^-
	- end of table -