V-QCD(APR), combined APR-holographic EoS, soft version

EoS Submission Details

EoS name	V-QCD(APR), combined APR-holographic EoS, soft version
category	Hybrid
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Abstract

These EoSs (soft, intermediate, and stiff variants) are mostly based on gauge/gravity duality and include both nuclear and quark matter phases. They were selected as representative examples from a larger family of EoSs constructed in [1]. EoSs of this type were first considered in [2]. They use the APR EoS [3] for nuclear matter at low densities, and the holographic V-QCD model for dense nuclear matter [4] as well as for quark matter [5]. To be precise, the EoSs are those considered in [1] with APR low density EoS, matching density of 1.6 times the saturation density, and V-QCD with potentials 5b, 7a, and 8b for the the soft, intermediate, and stiff variants, respectively.

References to the original work

1. N. Jokela, M. Jarvinen, G. Nijs and J. Remes, Phys. Rev. D 103, 086004 (2021) `https://doi.org/10.1103/PhysRevD.103.086004`

2. C. Ecker, M. Jarvinen, G. Nijs and W. van der Schee, Phys. Rev. D 101, 103006 (2020) `https://doi.org/10.1103/PhysRevD.101.103006`

3. A. Akmal, V. R. Pandharipande and D. G. Ravenhall, Phys. Rev. C 58, 1804 (1998) `http://dx.doi.org/10.1103/PhysRevC.58.1804`

4. T. Ishii, M. Jarvinen and G. Nijs, JHEP 07, 003 (2019) `https://doi.org/10.1007/JHEP07(2019)003`

5. N. Jokela, M. Jarvinen and J. Remes, JHEP 03, 041 (2019) `https://doi.org/10.1007/JHEP03(2019)041`

Nuclear Matter Properties[1]

	Quantity	Unit	
n_S	saturation density in symmetric matter	fm^{-3}	0.160
E_0	binding energy per baryon at saturation	MeV	16.00
K	incompressibility	MeV	266
K'	skewness	MeV	0
J	symmetry energy	MeV	32.59
L	symmetry energy slope parameter	MeV	58.47
K_{sym}	symmetry incompressibility	MeV	-102.63

Neutron Star Properties[1]

	Quantity	Unit	
M_{max}	maximum mass	M_{sun}	2.02
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o μ^-	M_{sun}	0
$R_{M_{max}}$	radius at maximum NS mass	km	11.9
$R_{1.4}$	radius at 1.4 M_{sun} NS mass	km	12.3
$\tilde{\Lambda}$	tidal deformability GW170817 at $q = M_1/M_2 = 0.8$		550

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	651

Range and density (#) of the grid parameters:

	Quantity	Unit	min	max	#
T	Temperature	MeV	0.0	0.0	1
n_b	Baryon Nr Density	fm^{-3}	1.e-12	10	651
Y_q	Charge Fraction		0	0	1

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

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