

# V-QCD(APR), combined APR-holographic EoS, intermediate version

## EoS Submission Details

EoS name	V-QCD(APR), combined APR-holographic EoS, intermediate 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](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](https://doi.org/10.1007/JHEP03(2019)041)

## Nuclear Matter Properties<sup>1</sup>

	Quantity	Unit	
$n_S$	saturation density in symmetric matter	$\text{fm}^{-3}$	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<sup>1</sup>

	Quantity	Unit	
$M_{max}$	maximum mass	$M_{sun}$	2.15
$M_{DU,e}$	mass at DUrca threshold (1/9) w/o $\mu^-$	$M_{sun}$	0
$R_{M_{max}}$	radius at maximum NS mass	km	11.8
$R_{1.4}$	radius at 1.4 $M_{sun}$ NS mass	km	12.4
$\tilde{\Lambda}$	tidal deformability GW170817 at $q = M_1/M_2 = 0.8$		590

## 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	$\text{fm}^{-3}$	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.

<sup>1</sup>0-values indicate, that the corresponding data is not provided.