HJJSTV holographic model for massless quark matter and transport, soft variant

EoS Submission Details

EoS name	HJJSTV holographic model for massless quark matter and transport, soft variant
category	Quark
submitted by	Niko Jokela/Matti Järvinen
affiliation	University of Helsinki/APCTP
e-mail contact	niko.jokela@helsinki.fi/matti.jarvinen@apctp.org
sheet creation date	April 27, 2023

Abstract

These quark matter EoSs (soft, intermediate, and stiff variants) are derived using the gauge/gravity duality in the V-QCD model for three flavors of massless quarks. The soft, intermediate, and stiff variants[1] refer to the V-QCD models with potentials 5b, 7a, and 8b, respectively, constructed in [JJR_2019]. We provide the EoSs also at finite temperature and at a non-vanishing charge fraction following the approach of [CJLV_2019] (see also [DEJ_2022]). As additional quantities, we have included the bulk and shear viscosities and thermal and electrical conductivities of the quark matter component as computed in [HJJSTV_2020].

References to the original work

[JJR_2019] N. Jokela, M. Järvinen, and J. Remes, JHEP 03, 041 (2019) https://doi.org/10.1007/JHEP03(2019)041

[CJLV_2019] P. M. Chesler, N. Jokela, A. Loeb, and A. Vuorinen, Phys. Rev. D 100, 066027 (2019) https://doi.org/10.1103/PhysRevD.100.066027

[DEJ_2022] T. Demircik, C. Ecker, and M. Järvinen, Phys. Rev. X 12, 041012 (2022) https://doi.org/10.1103/PhysRevX.12.041012

[HJJSTV_2020] C. Hoyos, N. Jokela, M. Järvinen, J. G. Subils, J. Tarrío, and A. Vuorinen, Phys. Rev. Lett. 125, 241601 (2020) https://doi.org/10.1103/PhysRevLett.125.241601

[1] These names refer to the stiffness of the EoS in the nuclear matter phase for which 1D tables are available in CompOSE, see the JJ(V-QCD(APR)) EoSs. In the quark matter phase there is no significant difference in the stiffness between the models.

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	1684881

Range and density (#) of the grid parameters:

	Quantity	Unit	min	max	#
T	Temperature	MeV	0.1	158.4893	81
n_b	Baryon Nr Density	fm^{-3}	1e-12	39.8107	341
Y_q	Charge Fraction		0	0.6	61

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.transport : available

index		Quantity	Unit
25	ζ	Bulk Viscocity	MeV fm^{-2}
26	η	Shear Viscocity	MeV fm^{-2}
27	κ	Thermal Conductivity	fm^{-2}
28	σ	Electrical Conductivity	fm^{-1}