

SAHA-S version 7

Introduction

Tables are provided for four sets of relative abundances of heavy elements. Three of them correspond to widely used Z mixtures MB22, AGSS09 and GN93. The last set includes only C, N, O and Ne, and abundances of these elements are taken exactly as in OPAL EOS tables. The mass fractions of heavy elements in SAHA-S7 are listed in the table:

	MB22	AGSS09	GN93	OPAL
C	0.196841	0.181632	0.177215	0.190661
N	0.060377	0.053204	0.054357	0.055848
O	0.425247	0.440270	0.493204	0.542978
Ne	0.128658	0.096497	0.098587	0.210511
Mg	0.038925	0.054363	0.038425	0.0
Si	0.049320	0.051061	0.041438	0.0
S	0.020917	0.023745	0.021621	0.0
Fe	0.079714	0.099223	0.075148	0.0

Mesh of SAHA-S

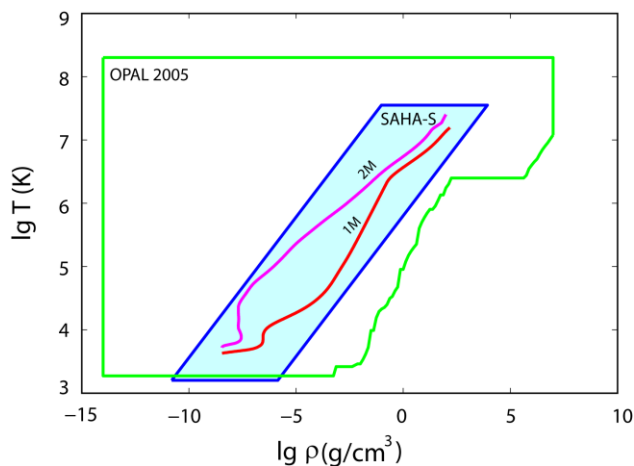
The SAHA-S tables are rectangular and have mesh evenly spaced in $\lg T$ and $\lg Q_s$:

Value	Range	Step	Knots
$\lg T$	3.20 ... 7.55	0.025	175
$\lg Q_s$	-4.50 ... 0.45	0.05	100
X	0.1 ... 0.9	0.1	9
Z	0.0 ... 0.020	0.005	5 [*]

[*] GN93 mixture is computed only for $Z=0, 0.01$ and 0.02 .

Here $Q_s = \rho / (T_6)^{2.25}$, $T_6 = T / 10^6$.

The following figure presents domains of definition for SAHA-S and OPAL equations of state. Red and magenta curves show points (ρ, T) from models of stars with 1 and 2 solar masses.



Description of data in SAHA-S7 tables

Each line of SAHA-S7 tables contains the following variables:

X	mass fraction of hydrogen
Z	mass fraction of elements heavier than helium
$\lg T$	logarithm10 of temperature [K]
ρ	density, in g/cm ³
$\lg Q_s$	logarithm10 of Q_s ; $Q_s = \rho / (T_6)^{2.25}$, $T_6 = T / 10^6$
P^{gas}	pressure, in dyne/cm ² [**]
χ_T^{gas}	$(d \ln P^{gas} / d \ln T) \Big _{\rho}$ [**]
χ_{ρ}^{gas}	$(d \ln P^{gas} / d \ln \rho) \Big _T$ [**]
C_V^{gas}	heat capacity, erg/(g*K) [**]
Γ_1^{gas}	adiabatic exponent [**]
$\ln(N_e)$	natural logarithm of electron concentration N_e [cm ⁻³]

[**] The values do not include contribution from radiation.

SAHA-S7 data files

These tables have been prepared from original SAHA-S version 7 tables.

saha7_agss.zip – for AGSS09 mix (37 Mb)
saha7_opal.zip – for OPAL mix (37 Mb)
saha7_gn.zip – for GN93 mix (22 Mb)
saha7_mb22.zip – for MB22 mix (37 Mb)