

Units

March 5, 2024

1 Unit systems

Note: the adiv energy unit is called the Jerk, whereas in cgs units it is called the erg.

2 adiv

variable	definition	in SI
Length	cm	
Mass	g	
Time	sh	
Temperature	KeV	
Velocity	cm/sh	
Energy	$\text{g} \cdot \text{cm}^2 / \text{sh}^2$	$10^9 \text{ J} (10^3 \text{ MJ})$
Pressure	$\text{g} / \text{cm} \cdot \text{sh}^2$	$10^{15} \text{ Pa} (10^4 \text{ Mbar})$
Density	g / cm^3	
Intensity	g / sh^3	$10^{21} \text{ W/m}^2 (10^{17} \text{ W/cm}^2)$

The Stefan-Boltzman law is

$$I = \frac{1}{\pi} \sigma T^4, \quad (1)$$

where

$$\sigma = \frac{2\pi^5 k_B^4}{15c^2 h^3}. \quad (2)$$

If we introduce

$$\eta = \frac{2\pi^5}{15c^2 h^3}, \quad (3)$$

then we can re-write the Stefan-Boltzman law as

$$I = \frac{1}{\pi} \eta (k_B T)^4. \quad (4)$$

The value of η in adive units can be be derived as follows

$$\begin{aligned}
\eta &= 1.5605532983363822 \times 10^{84} \frac{1}{\text{s} \cdot \text{m}^2 \cdot \text{J}^3} \\
&= 1.5605532983363822 \times 10^{84} \frac{\text{J}}{\text{s} \cdot \text{m}^2 \cdot \text{J}^4} \left| \frac{1.602176634 \times 10^{-16} \text{J}}{1 \text{keV}} \right|^4 \left| \frac{1 \text{m}}{10^2 \text{cm}} \right|^2 \\
&= 1.028300817017691 \times 10^{17} \frac{\text{J}}{\text{s} \cdot \text{cm}^2 \cdot \text{keV}^4} \\
&= 1.028300817017691 \times 10^{17} \frac{\text{W}}{\text{cm}^2 \cdot \text{keV}^4} \\
&= 1.028300817017691 \frac{\text{g}}{\text{sh}^3 \cdot \text{keV}^4}.
\end{aligned} \tag{5}$$

3 bdiv

variable	definition	in SI
Length	cm	
Mass	g	
Time	us	
Temperature	KeV	
Velocity	cm/us	
Energy	$\text{g} \cdot \text{cm}^2 / \text{us}^2$	$10^5 \text{ J } (10^{-1} \text{ MJ})$
Pressure	$\text{g} / \text{cm} \cdot \text{us}^2$	
Density	g / cm^3	
Intensity	g / us^3	$10^{15} \text{ W/m}^2 (10^{11} \text{ W/cm}^2)$