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Abstract

1 The System of Units

We define a new time unit T such that a wave number $\tilde{\nu}$ has the same value as the corresponding angular wave frequency $\omega = \tilde{\nu} 2\pi c$ (c is the speed of light).

	SI	New
ν	$1\,\mathrm{cm}^{-1}$	$1\mathrm{cm}^{-1}$
ω	$1.883\,651\,567\,308\,853\,1 \times 10^{10}\,\mathrm{s}^{-1}$	$1\mathrm{T}^{-1}$
Time Unit(SI)	$1\,\mathrm{s}$	$1.8836515673088531 \times 10^{10}\mathrm{T}$
Time Unit(New)	$5.308\,837\,458\,876\,145 \times 10^{-12}\,\mathrm{s}$	$1\mathrm{T}$

Table 1: The Defining Relationship: $\omega = 2\pi c\nu$. $c = 299\,792\,458 \times 10^{10}\,\mathrm{cm\,s}^{-1}$.

We define a new energy unit E such that Planck's constant $\hbar$ is 1ET. Planck's constant in SI is $1.054\,571\,817 \times 10^{-34}\,\mathrm{J\,s}$. Once E is defined, for $\tilde{\nu} = 1\,\mathrm{cm}$, we have corresponding energy $\mathcal{E} = \hbar\omega = 1\mathrm{ET} \times 1\mathrm{T}^{-1} = 1\mathrm{E}$.

	SI	New
$\hbar$	$1.054\,571\,817 \times 10^{-34}\,\mathrm{J\,s}$	$1\mathrm{E} \cdot \mathrm{T}$
Time Unit(SI)	$1\,\mathrm{s}$	$1.8836515673088531 \times 10^{10}\mathrm{T}$
Time Unit(New)	$5.308\,837\,458\,876\,145 \times 10^{-12}\,\mathrm{s}$	$1\mathrm{T}$
Energy Unit(SI)	$1\,\mathrm{J}$	$5.0341165706272096 \times 10^{22}\mathrm{E}$
Energy Unit(New)	$1.986\,445\,855\,931\,795 \times 10^{-23}\,\mathrm{J}$	$1\mathrm{E}$

Table 2: The Defining Relationship: $\hbar = 1.054\,571\,817 \times 10^{-34}\,\mathrm{J\,s} = 1\mathrm{ET}$.

With the energy unit defined, we check the value of Boltzmann's constant in this system of units.

Constants	SI	This System
$\hbar$	$1.054\,571\,817 \times 10^{-34}\,\mathrm{J\,s}^{-1}$	$1\mathrm{ET}^{-1}$

	SI	New
Energy Unit(SI)	$1\,\mathrm{J}$	$5.0341165706272096 \times 10^{22}\mathrm{E}$
Energy Unit(New)	$1.986\,445\,855\,931\,795 \times 10^{-23}\,\mathrm{J}$	$1\mathrm{E}$
k_B	$1.380\,649 \times 10^{-23}\,\mathrm{J\,K^{-1}}$	$0.6950348009119888\mathrm{EK^{-1}}$

Table 3: The Defining Relationship: $k_\mathrm{B} = 1.380\,649 \times 10^{-23}\,\mathrm{J\,K^{-1}} = 1.380\,649 \times 10^{-23}\,\mathrm{J\,K^{-1}} \times 15.0341165706272096 \times 10^{22}\,\frac{\mathrm{E}}{J} = 0.6950348009119888\mathrm{EK^{-1}}$.