

The Planckian Hierarchal Schematic

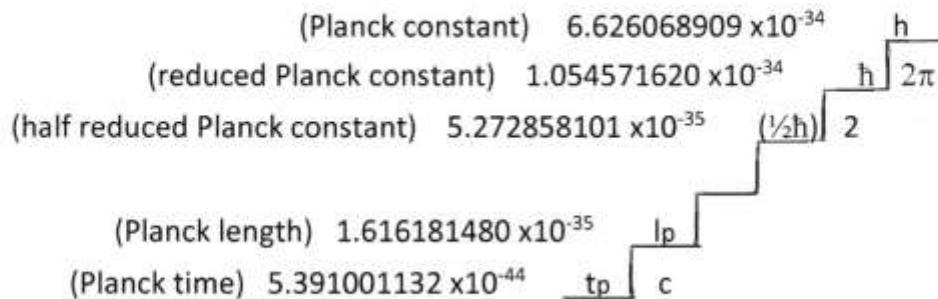
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Abstract

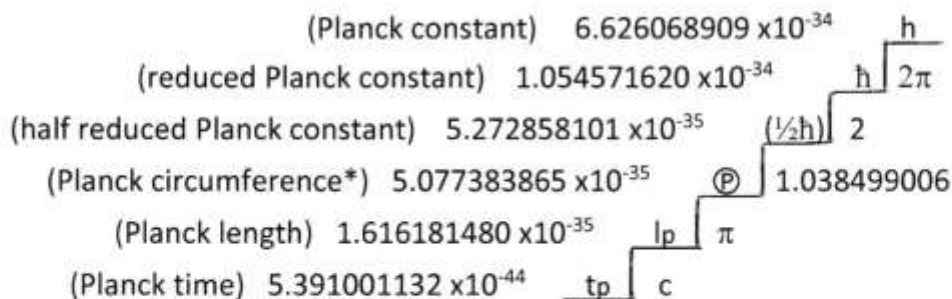
The construction of the Planckian hierarchal schematic, comprised of four very well-known Planck constants, i.e., h , \hbar , l_p and t_p . The reintroduction of a forgotten constant, $\frac{1}{2}\hbar$. The postulation of a new Planck constant - the Planck circumference, symbol \textcircled{P} , where the Planck length is its diameter. The natural outcome of π as the ratio of the Planck length and Planck circumference. Also, the initialization of the ratio of $\frac{1}{2}\hbar$ and the Planck circumference, \textcircled{P} , with a value of 1.038499006, referred to, as the ratio of attribute. The crux of this paper is to show that the dimensionless ratios of the Planckian schematic (i.e., 2, 1.038499006, π and c) can be utilized to enumerate the Planck momentum, Planck mass and the Planck energy constants.

Standard model (incomplete) Planckian hierarchal schematic:

(five well-known Planck constants in an hierarchal configuration)



Proposed (complete) Planckian hierarchal schematic, with the postulated Planck circumference constant, symbol \textcircled{P} , and two respective ratios: π & 1.038499006.



Half of the reduced Planck constant, ($\frac{1}{2}\hbar$) “The forgotten constant”, During the quantum revolution, Neils Bohr proposed that the reduced Planck constant, symbol $\hbar = h/2\pi$, was the smallest attribute of a particle, .i.e., the quantization of its orbital angular momentum. Then, in 1925, physicists Sam Goudsmit and George Uhlenbeck discovered that the electron also possessed spin angular momentum with a magnitude of half of the reduced Planck constant, symbol ($\frac{1}{2}\hbar$). This gave Dirac the fourth quantum number to codify his equation. [4] Though, the importance of spin cannot be over-stated; It will be demonstrated that half of the reduced Planck constant ($\frac{1}{2}\hbar$), is a crucial player (above and beyond its definition of spin) in the scheme of fundamental physics. It will be shown to have a prominent role in the hierarchical evolution of the constants. The National Institute of Standards and Technology (NIST) does not list half of the reduced Planck constant ($\frac{1}{2}\hbar$).[1]

π , In the thirty-five hundred years since its discovery, physicists have been unable to give π a definable function within the context of fundamental equations, albeit ubiquitous. The Planckian schematic shows the first π as a ratio in the hierarchal schematic.

First pi equation:

(Planck circumference, \textcircled{P} divided by the Planck length, l_p)

$$\pi = \frac{\textcircled{P}}{l_p}$$

Ratio of attribute

(half of the reduced Planck constant, $\frac{1}{2}\hbar$ divided by the Planck circumference, \textcircled{P})

$$\frac{(\frac{1}{2})\hbar}{\textcircled{P}} = 1.038499006$$

Enumerated constants, via ratios of the Planckian hierarchal schematic:

Planck momentum

$$MOp = 2 \left[\frac{(\frac{1}{2})\hbar}{\mathcal{P}} \right] \pi = 6.52508$$

Planck mass

$$mp = \frac{2 \left[\frac{(\frac{1}{2})\hbar}{\mathcal{P}} \right] \pi}{c} = 2.176532972 \times 10^{-8} \text{ kg}$$

(The speed of light, c , value: 299792458, utilized as a dimensionless constant)

Note: within the 2010 (NIST) CODATA value: $2.17651(13) \times 10^{-8} \text{ kg}$

The NIST lists the Planck mass equation (standard model) as: $mp = (\hbar c/G)^{1/2}$ [1]

Planck energy

$$Ep = 2 \left[\frac{(\frac{1}{2})\hbar}{\mathcal{P}} \right] \pi c = 1.9561 \times 10^9$$

half of reduced Planck constant

$$(\frac{1}{2})\hbar = \mathcal{P} \left[\frac{(\frac{1}{2})\hbar}{\mathcal{P}} \right] = 5.272858101 \times 10^{-35}$$

Reduced Planck constant (h-bar)

$$\hbar = 2 \mathcal{P} \left[\frac{(\frac{1}{2})\hbar}{\mathcal{P}} \right] = 1.054571619 \times 10^{-34}$$

Planck Constant

$$h = 4\pi \mathcal{P} \left[\frac{(\frac{1}{2})\hbar}{\mathcal{P}} \right] = 6.626068909 \times 10^{-34}$$

Planck Temperature

$$T_p = \frac{2 \left[\frac{(\frac{1}{2})\hbar}{\mathcal{P}} \right] \pi c}{k} = 1.41684693 \times 10^{32}$$

where: $k = 1.38065048 \times 10^{-23}$ (Boltzmann constant)

Conclusion

The enumeration of the Planck – momentum, mass and energy, solely by the dimensionless constants of the Planckian hierarchal schematic: 2, 1.038499006, π and 299792458. (something that has never been done before)

References

- [1]. NIST, Fundamental Physical Constants (2006 / 2010 / 2014)
- [2]. Quantum Dance, Princeton.edu, Feb. 18, 2009
- [3]. Kenneth W. Ford, The Quantum World, Harvard University Press, USA (2004)
- [4] John D. Barrow, The Constants, Pantheon Books, USA (2002)