

Errors In The International System Of Units (SI)

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Abstract

It was shown in „Search for the World Formula”¹ and “Quantum Theory and General Relativity from the Perspective of the “World Formula”² that “time” is incorrectly defined in the “International System of Units (SI)” and that the speed of light in a vacuum c is not a natural constant, but represents the earth's surface rotating around its own axis. In this article, it is again derived why and in what form the system of units as a definition building and basis of science in the form given by the BIPM³ is incorrect and would have to be corrected in order to be able to convey an accurate world view.

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¹ Pohl M.U.E (2022): Search for the World Formula, Scientific God Journal Vol 13 No1, <https://scigod.com/index.php/sgj/article/view/781>

² Pohl M.U.E (2022): Quantentheorie und Allgemeine Relativitätstheorie aus Perspektive der „Weltformel“, <https://vixra.org/abs/2210.0020>

³ Bureau International des Poids et Mesures, <https://www.bipm.org/en/home>

1 Definition of time T by the BIPM

In "Search for the World Formula" it was shown that the definition of time in the SI unit system of the BIPM is inadmissible because it violates a "basic law" on the definition

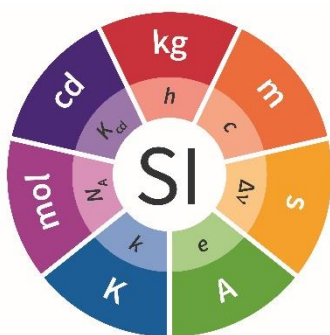
“The first requirement is: what is to be defined must not appear again in the definition (terminus definitus non debet ingredi definitionem), because if this were so, one would not find out what is to be defined, the same thing would be explained by the same thing, idem per idem as they say...”⁴

and defines the term of the period (time) solely on the basis of the term of the period (time) - i.e. "idem per idem" - and thus represents a classic "circle definition".

$$T_{\text{second}} = 1 \text{ Second} = \frac{9192631770}{f_{133\text{Cs}}} = 9192631770 \cdot T_{133\text{Cs}} \quad (1)$$

Based on this definition, it remains completely unclear what time actually is in the physical sense and how it could be "measured". In the SI system of units, this deficiency is "concealed" by the fact that the "frequency" f_{Cs133} ($\Delta\nu_{\text{Cs}}$) used for the definition is simply declared a "natural constant".

The International System of Units (SI) : Defining Constants⁵:



Defining Constant	Numerical Value	Unit
Cäsium-Hyperfinefrequency $\Delta\nu_{\text{Cs}}$	9 192 631 770	Hz
Speed of Light c	299 792 458	m s ⁻¹
Planck-Constant h	6.626 070 15 x 10 ⁻³⁴	J s
Elementary Charge e	1.602 176 634 x 10 ⁻¹⁹	C
Boltzmann-Constant k	1.380 649 x 10 ⁻²³	J K ⁻¹
dAvogadro-Constant N_{A}	6.022 140 76 x 10 ²³	mol ⁻¹
luminous efficacy of a defined visible radiation K_{cd}	683	lm W ⁻¹

However, this only makes the incorrectness of this definition all the more clear, because the "constancy" of this frequency is "measured" on the basis of the frequency itself. It is therefore not possible to prove in experiments whether this "constant" is actually constant. This is claimed, but not experimentally falsifiable. As also discussed and shown in "Metaphysical Basis for a Unified World View: Definition of Space and Time"⁶, theories based on such a non-falsifiable circular definition of time (quantum theory and general theory of relativity) are consequently also non-falsifiable.

⁴ Karl Christian Friedrich Krause: Die Lehre vom Erkennen und von der Erkenntnis, als erste Einleitung in die Wissenschaft. Vorlesung für Gebildete aus allen Ständen. Dietrich'sche Buchhandlung, Göttingen 1836, S. 502.

⁵ <https://www.bipm.org/en/measurement-units/si-defining-constants>

⁶ Pohl M.U.E (2022): Metaphysical Basis for a Unified World View: Definition of Space and Time, <https://vixra.org/abs/2207.0133>

2 Definition of Length L by the BIPM

The definition of length in space in the SI unit system is based on the postulated / assumed constant speed of light in a vacuum "c" and the assumed "constant" hyperfine frequency of the cesium 133 atom:

$$L_{\text{Meter}} = 1 \text{ Meter} = \frac{9192631770}{299792458} \cdot \frac{c}{f_{\text{Cs133}}} \quad (2)$$

The constancy of both "constants", i.e. the hyperfine frequency and the speed of light, is therefore only "asserted", but not falsifiable.

In establishing the definitions of length in space and duration, the BIPM also disregards the fact that length in space (as a consequence of the circular definition of duration in terms of a supposedly constant frequency) as a "second" circular definition elsewhere as a "counterpart" must occur to define time, because the speed of light in a vacuum is used as a constant to define length and therefore the length L must also be given in a circle definition. This second definition of the length of space actually occurs through the "discovery" of Planck's constant in a number of other natural constants, e.g. in the Planck length, the Compton wavelength of the electron, the classical electron radius, the Bohr radius and finally in the Rydberg constant.

One of these natural constants, here for example the Rydberg constant R_{∞} in the unit meter⁻¹:

$$R_{\infty} = \frac{\alpha^2 m_e c}{2h} [m^{-1}] \quad (3)$$

α = fine structure constant, m_e = electron mass,
c = speed of light in vacuum, h = Planck's constant

can be this second - alongside the definition of the speed of light - and thus "double" definition of length in space, which the BIPM "lets fall under the table". The "second" factually existing definition of length in space, e.g. write:

$$L_{\text{Meter}} = 1 \text{ Meter} = \frac{2h}{\alpha^2 m_e c} \cdot 10973731,568160 = \frac{10973731,568160}{R_{\infty}} \quad (4)$$

It was shown in "Metaphysical Basis for a Unified World View: Definition of Space and Time" that the definition of duration and length in space, however, must be mutually defined through the concept of motion in general.

However, since this necessity is ignored by BIPM and "current science", there is a state in basic theoretical physics in which either time or length in space are to be understood as "double" defined. Because either it follows from three "natural constants" (e.g. f_{Cs133} , R_{∞} and c) that the length is defined twice

(5)	(6)	(7)
$1 \text{ Second} = \frac{9192631770}{f_{133\text{Cs}}}$	$1 \text{ Meter} = \frac{9192631770}{299792458} \cdot \frac{c}{f_{\text{Cs133}}}$	$1 \text{ Meter} = \frac{10973731,568160}{R_{\infty}}$

, or it turns out that the duration is doubly defined:

(8)	(9)	(10)
$1 \text{ Second} = \frac{9192631770}{f_{133Cs}}$	$1 \text{ Meter} = \frac{9192631770}{299792458} \cdot \frac{c}{f_{Cs133}}$	$1 \text{ Second} = \frac{\alpha^2 m_e \cdot 299792458 \text{ Meter}^2}{2h \cdot 10973731,568160}$

However, since a nominal definition of a physical quantity and unit also represents the measurement specification for this physical quantity, two different measurement specifications must not exist, since their identity would not be falsifiable. The error in the BIPM system of units can be represented in abstract form in such a way that two physical variables are defined by three natural constants, which is :

$$1 \text{ second} = \text{natural constant at time } (f_{Cs133})$$

$$1 \text{ meter} = \text{natural constant for the relationship between space and time } (c) * \text{natural constant for time}$$

$$1 \text{ meter} = \text{natural constant of length } (R_\infty)$$

Although the diameter of Mars could be determined experimentally after defining length by the diameter of the Earth, a "second" definition of length by the diameter of Mars in the sense of

$$1 \text{ meter} = \text{diameter}_{\text{Earth}} \text{ and } 1 \text{ meter} = 1.88 \text{ diameter}_{\text{Mars}}$$

result in a unit system that would allow two different theories about reality, both of which would be fundamentally conceptually incompatible.

3 Summary

It was shown that the SI unit "time" as a circular definition is fundamentally incorrectly defined. For example, based on the existence of the Rydberg constant R_∞ , it can be proven that it follows that length must also appear as a circular definition and thus either length or time are defined "double" due to the speed of light postulated as constant, what is not permissible in a consistent system of units.

As a result, it can be shown again from a different perspective why quantum theory and general relativity are conceptually incompatible.