On the International System Of Units (SI)

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Abstract

It was shown in „Search for the World Formula"[1] 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 BIPM[2] 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] 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..."[3]

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".

$$T_{Second} \, [second] = 1 \, [second] = 9192631770 \cdot T_{Cs133} \, [second] \qquad (1)$$

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} ($\Delta \nu_{Cs}$) (T_{CS133}) used for the definition is simply declared a "natural constant".

The International System of Units (SI) : Defining Constants[4]:
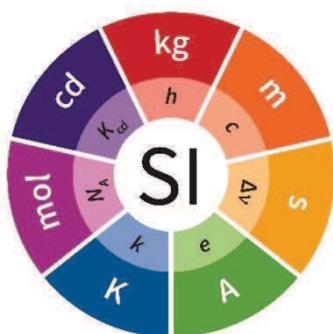
Defining Constant	Numerical Value	Unit
Cäsium-Hyperfinefrequency $\Delta \nu_{Cs}$	9 192 631 770	Hz
Speed of Light c	299 792 458	m s^{-1}
Planck-Constant h	6.626 070 15 x 10^{-34}	J s
Elementary Charge e	1.602 176 634 x 10^{-19}	C
Boltzmann-Constant k	1.380 649 x 10^{-23}	J K^{-1}
dAvogadro-Constant 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"[5], theories based on such a non-falsifiable circular definition of time (quantum theory and general theory of relativity) are consequently also non-falsifiable.

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[3] 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.
[4] https://www.bipm.org/en/measurement-units/si-defining-constants
[5] 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:

$$L_{Meter} = 1\, Meter = \frac{9192631770}{299792458} \cdot \frac{c}{f_{cs133}} \tag{2}$$

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}:

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

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:

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

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)
$1\, Second = \dfrac{9192631770}{f_{133Cs}}$	$1\, Meter = \dfrac{9192631770}{299792458} \cdot \dfrac{c}{f_{cs133}}$	$1\, Meter = \dfrac{10973731{,}568160}{R_\infty}$

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

(8)	(9)	(10)
$1\ Second = \dfrac{9192631770}{f_{133Cs}}$	$1\ Meter = \dfrac{9192631770}{299792458} \cdot \dfrac{c}{f_{cs133}}$	$1\ Second = \dfrac{\alpha^2 m_e \cdot 299792458\ Meter^2}{2h \cdot 10973731{,}568160}$

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 second = natural constant at time (f_{Cs133})
1 meter = natural constant for the relationship between space and time (c) * natural constant for time
1 meter = natural constant of length (R_∞)

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

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

3 Fine structure constant

Another important aspect of the ill (circular) defined unit of time can be seen by writing (1) as

$$1\ [Second] = 9192631770 \cdot T_{Cs133}\ [second] \tag{11}$$

Against what a definition the space in a similar way would look like

$$1\ [meter] = 12756270 \cdot L_{Diameter-earth}\ [Meter] \tag{12}$$

As there is only one physical quality "time" as property of physical nature and only one physical quality of "length" asproperty of nature, quality T_{second} is identical to T_{Cs133} and L_{Meter} is identical to $L_{Diameter-earth}$ and (11) and (12) must be written as

$$\left[\frac{1}{919263177}\right] = T_{Cs133}[\,] \tag{13}$$

And

$$\left[\frac{1}{12756270}\right] = L_{Diameter-earth}[\,] \tag{14}$$

This would openly show that physical properties or phenomena of nature are simply defined here using an arbitrarily chosen number. One could understand this in such a way that, for example, a meter in length is simply defined as the diameter of the earth and the earth's diameter is considered as a physical constant. But that would of course also be a circular definition, because if you measure the earth's diameter based on the earth's diameter, this is of course only apparently "constant". As the Meter of length is defined on basis of the constant speed of light, in fact this definition is not a circular definition, but can be written as

$$\frac{L[meter]}{T[second]} = 299792458\ \frac{[meter]}{[second]} \quad \rightarrow L[\,] = T\,[299792458\,] \tag{15}$$

which shows that this "Definition" of a physical quality is not a circular definition but in fact a definition for both qualities, a definition for the length on basis of quality time and a definition for the duration on basis of the length (Following Einstein's suggestion to declare the speed of light (T or Time) in a vacuum (L^3 or Length^3) to a physical constant "over time", which in fact introduces "two" definitions for the same physical quality.

While the meter of length is not given in a circular definition in the International System of Units, the definition for Time (13) is a circular definition. In addition to the definition of time (duration) based on the speed of light, a second definition of time has actually been introduced in the system of units also from this perspective, which is based solely on an arbitrarily chosen number.

Many theoretical physicist now wonder why there is existing the physical constant "fine-structure-constant α as property / quality of nature, when this shows no physical dimension / unit. The answer is quite simple, as this constant α only reflects and is effect of the circular and arbitrarily chosen definition for T_{CS133} .

$$\alpha = [137{,}035999084\ ] = \frac{e^2}{2\pi\varepsilon_0 hc} \tag{16}$$

"It has been a mystery ever since it was discovered more than fifty years ago, and all good theoretical physicists put this number up on their wall and worry about it. Immediately you would like to know where this number for a coupling comes from: is it related to p or perhaps to the base of natural logarithms? Nobody knows. It's one of the greatest damn mysteries of physics: a magic number that comes to us with no understanding by man. You might say the "hand of God" wrote that number, and "we don't know how He pushed his pencil." We know what kind of a dance to do experimentally to measure this number very accurately, but we don't know what kind of dance to do on the computer to make this number come out, without putting it in secretly!"

Richard P. Feynman[6]

It is simple to see that the dimensionless fine structure constant is defined on basis of speed of light in a vacuum that is defined on basis of the circular definition of T_{Cs133} and therefore a logical effect of this "error" in within the international System of Units (SI).

4 Correction of the error

To correct the error The International System Of Units (SI) the interpretation of a "Frequency" that is used as f=1/T as well as at the same time as f=ω/2π must not be used to define the physical Dimension "Time" with T = 1/f but with two geometrical Dimensions of time as spherical coordinates (without an arrow of time):

$$T_2[second] = \frac{\pi\ [meter]\ T_1[second]}{L\ [meter]} \tag{17}$$

to represent the 5D Spacetime ($L^3 T^2$)

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[6] QED – The strange theory of light and matter, Princeton University Press 1985, S. 129

5 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. It was shown that this "double" defined quality of time also is represented by the existence of the fine-structure-constant α.

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