Is time dilation a real physical nature of time?

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Abstract

In the current physical literature , there are many articles discussing the physical nature of time , in which *time dilation* is a controversial aspect of time . In this article we will search to see how physicists have come the elusive concept of time dilation and try to confirm whether it is a real physical process or only an observational phenomenon.

1 . The increase of lifetime of high speed muons . (1)

Two following phenomena are often mentioned in the literature to demonstrate that time dilation is a real physical nature of time :

1/ Experiments performed at CERN showed that muons at speed of 0.99 c were found to have an average lifetime 29 times as large as that of muons at rest .

2/ The finding of muons at sea level by **Seth Neddermeyer** in 1936 proved that because of their high speed (0.999 c) , their lifetime has physically increased from 2 μs to 30 μs so that they can in fact travel over 9000 m instead of 600 m , and thereby they can reach the sea level .

From these data , physicists of modern physics believe that time dilation is no doubt a real physical phenomenon .

But **Guido F. Nelissen** , in his article " Physical Nature of Time " (2019) came to an inconclusive view on the time dilation : it still remains as a question .

" From this we must conclude that, roughly a hundred years after its publication , the ambiguity about the physical nature of time and the time dilation has not yet been properly cleared out and that therefore the question remains whether time dilation is a genuine physical process or an observational phenomenon ? "

That is , Nelissen has not made a final decision on the physical nature of the time dilation .
In the following sections we will present our viewpoint on whether or not the time dilation is a real physical process .

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(1) This section is a brief extraction about time dilation from the article " Physical Nature of Time " of Classical Physics by **Guido F. Nelissen** , published in May 2019 at the website www.viXra .org : 1905.0398 ; page 4

The purpose of this article is to present the viewpoint of the author that the **time dilation does not exist physically** although the lifetime of a moving muon does increase with its velocity .

2 . The muon is a version of the electron

First , let's define the average lifetime of the muon (μ^-) :

The muon is created when the pion (π^-) decays : $\pi^- \rightarrow \mu^-$, and after a very short time , the muon decays into the electron : $\mu^- \rightarrow e^-$. The lapse of time between these two events is the average lifetime of the muon : $\tau \approx 2.2\ \mu s$

When physicists observed the increase of lifetime of relativistic muons (at CERN and at sea level) , they thought this is because " time dilates" . But this increase of elapsed time can be explained by a new theory : the variability of the electric charge of the muon by its velocity and the applying field also causes its lifetime to change . In this case , the concept of time dilation becomes unnecessary or useless : it may be replaced by a new concept .

The new theory of the extended electron has been presented in a series of articles in the website www.viXra.org/author/hoa_van_nguyen . It presents **the following new concepts** in the link between the electron and muon :

The muon (like the electron) is an extended particle with internal components , not a mere point charged particle **[1]**. It is the same particle as the electron : μ^- has the same mass as the e^- but its electric charge is much lower when it is created **[2] & [3]**: $e_{(\mu)} = 7.74 \times 10^{-22}$ C while the electric charge of the electron is $e = 1.602 \times 10^{-19}$ C .

This means that muon is a version of the electron with reduced and varying electric charge : the muon differs from the electron by its electric charge , not by its mass .
Due to its reduced electric charge , muon is much more penetrating into matter than the electron . This new idea is evidently contrary to the mainstream concept of modern physics **(2) & (3)** except that *it is like an electron almost every way* .

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(2) " *The muon is a mystery ; it is like an electron almost every way but its mass . There is no known reason why it must exist ...* " (Lehrmann & Swartz , Foundation of Physics , 1969 , p.697)

" Muons even today represent something of a puzzle ... Only in its mass and stability does the muon differ significantly from the electron , leading to the hypothesis that the muon is merely a kind of ' heavy electron ' rather than a unique entity ." (A.Beiser , Concept of Modern Physics , 1981)

(3) The **tau particle** τ is analogous to muon : it is a version of the electron ; i.e., it has the same mass as the electron but its charge is much reduced : $\mathbf{e}_{(\tau)} = 0.46 \times 10^{-22}$ C , and hence it is *potentially highly penetrating , much more than electrons (Wikipedia Encyclopaedia)* .
Please read section V of Ref.[3] : if we renormalize the electric charge of the electron , instead of renormalizing its mass , we will get the reduced charges of muon and tau particles : $\mathbf{e}_{(\mu)}$ and $\mathbf{e}_{(\tau)}$ as shown above .

The physical reason for this is that the electric charge of the electron is an effective one which is a function of its velocity and the applying field [2] according to the equation

$$\boxed{q = \gamma^{-N} q_0} \quad \text{or} \quad \boxed{q = (1 - v^2/c^2)^{N/2} q_0} \qquad (1)$$

where $\gamma = (1 - v^2/c^2)^{-1/2}$ is the Lorentz factor , q_0 is the electric charge of the electron at rest ; i.e., $q_0 \equiv e$, and the real number $N \geq 0$ representing the applying field (electric or magnetic) . Fig.1 shows the graph of Eq.(1) plotted by computer .

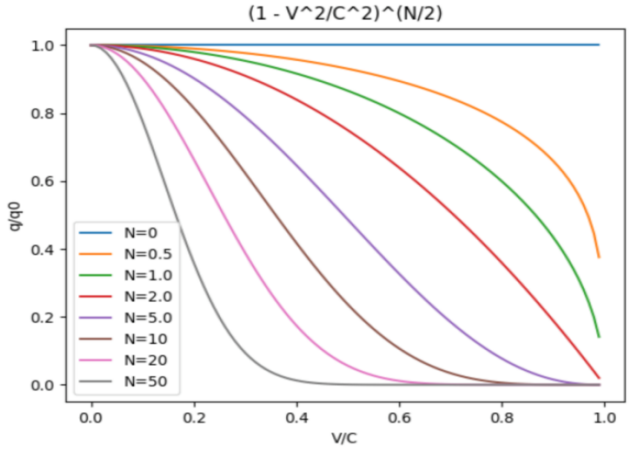

Fig.1 : $q / q_0 = (1 - v^2/c^2)^{N/2}$

The graph shows that the higher the velocity and / or the stronger the applying field N , the lower the effective electric charge of the electron , and as $v \rightarrow c$, $q \rightarrow 0$ (for $N \geq 2.0$) .

We will use this chart to explain the changes of the lifetime of the muon in different external applying fields N .

3. Why the lifetime of the muon increases with its velocity ?

When the muon is created , its velocity is near c ($\approx 0.99\ c$) and its charge q very low ($\approx 7.74 \times 10^{-22}$ C) . So the representing point M of the muon lies on the lower right end of one of the curve in Fig.1 (for example , the red curve N = 2.0) . After being created , the muon

slows down and stops in the medium of the detector : the representing point M moves on the same red curve to the origin point ($v/c = 0$, $q / q_0 = 1.0$) (upper left end) which represents the electron at rest ; that is , **the muon becomes the electron** . The lapse of time between two events (decays : $\pi^- \rightarrow \mu^-$ and $\mu^- \rightarrow e^-$) is the average lifetime of the muon : $\tau = 2.2\ \mu s$.

Now , since the creation of the muon may occur in different physical conditions on velocities and fields (as in the lab at CERN or in the atmosphere) , the representing point M of the muon thus can lie on any curve N of the graph in Fig.1 , and therefore it moves to the origin point in different lapses of time . This elapsed time is needed for the muon to be transformed into the electron . Therefore , the lifetime of the muon changes with its velocity and with the field in which it is created .

Conclusion :

Therefore , by using the new concept of the variability of the electric charge of the electron (as described by Eq.(1) and Fig.1) , we can explain the changes of the lifetime of the muon with its velocity and applying field **without the need of the concept of time dilation** .

Time does not dilate nor shrinks : it is absolutely invariant as conceived by **Newton** .
The concept of time dilation leads to counter intuitive ideas of " **length contraction** " and the so-called " **twin paradox**" : both ideas are old-fashioned and superfluous for the modern physics .

In previous articles [3]&[4] we used the concept of variability of the electric charge of the electron to explain **the mystery of the mass of the muon** and **the generation of anti-particles** of **Dirac** and more. The theory of the extended electron will provide a new prospect for the modern physics , which physicists used to call "new physics" .

References

The theory of the extended model for the electron is presented in a series of articles at the website **www.viXra.org/author/hoa_van_nguyen** ; including :

[1] A new extended model for the electron (viXra : 1305.0025)

[2] Electron ' s mass and electric charge , which one changes with velocity ?
(viXra : 1304.0066)

[3] Conceptual conflicts inspire new theories (The mystery of the mass of the Muon)
(viXr : 2004. 0039)

[4] A theory of the extended electron (Anti-particles of Dirac and Majorana)
(viXra: 2010.0202)