The shortest time span

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Abstract: The article presents the errors of German researchers who measured the shortest period of time on the basis of one hydrogen H2 molecule.

The idea of writing this article came to my mind after having read the short information on the website https://kopalniawiedzy.pl/zeptosekunda-najkrotszy-odcinek-czasu-swiatlo-molekula,32799.*1) There, the author informs about the shortest span of time measured so far. The measurement was made by German physicists using a single molecule of hydrogen H2. The molecule was excited in the accelerator by means of X-rays. The author of the article writes:
"The energy of the rays was chosen so that a single photon was enough to eject both electrons from the molecule. The electrons behave simultaneously like particles and waves.
Ejection of the first resulted in the appearance of a wave, and after a while a wave of the second electron joined. On the other hand the photon acted like a flat pebble that jumped twice on the waves."

In the article, the author also cites the "revealing" statement of prof. Reinhard Dörner:
"It is the first time we have seen that the electrons in a molecule do not react to light at the same time. The delay occurs because information in the molecule travels at the speed of light. Thanks to this research, we can improve our technology and use it for other ones."

The statement of prof. R. Dörner is "revealing" is in quotation marks, because the electrons in the H2 hydrogen molecule are fragments of matter that are bound to individual hydrogen atoms. The influence of the X-ray pulse on individual hydrogen atoms in the H2 molecule took place at different times. Why? Because the molecule was specially positioned in relation to the radiation source in such a way that the radiation reached individual hydrogen atoms at different times. In other words, the axis through the centres of the hydrogen atoms was approximately parallel to the direction of the emitted the X-ray pulse.

But before we go any further, some caveats need to be made. They refer to the fact that researchers call the photon a short wave of X-ray radiation that is able to "throw out" two electrons from the hydrogen molecule H2. This is just an impulse that can be composed of many waves. The pulse reached in sequence, first the first hydrogen atom, and then the second hydrogen atom. It also contributed to the excitation of matter vibrations in both atoms, which vibrations - in turn - in the form of waves reached the recording receiver and there they appeared in the form of an image of interfering waves.

How can you logically explain the course of physical phenomena? This can be explained in such a way that the electron can indeed appear as a particle in some situations, and it can manifest its wave nature in others. Because the electron is not a single component of an atom - it is a set of many particles called protoelectrons. It is a condensed cluster of protoelectrons that was created as a result of the action of physical processes. These processes are presented more specifically in the article "The essence of fundamental particles of matter and of interactions" on http://pinopa.narod.ru/Protoelektron_uk.pdf (and in Polish on https://www.salon24.pl/u/swobodna-energia/495577). This density can actually be treated as a

particle because it can exist on its own after being separated from the atom. However, due to the fact that it is composed of particles, it can be excited to vibrate and become a source of propagating waves.

The particles, which are called electrons and are ejected from the conventional volume of the atom, may differ from each other. The fact that physicists do not see these differences nowadays is due to the physicist Robert A. Millikan. About his incomplete, deliberately limited information, which he presented to the scientific world in his time, see the article at https://vixra.org/pdf/1905.0169v1.pdf (and at http://pinopa.narod.ru/Oszustwo_Millikana.html).

Also, German researchers do not provide fully reliable data on the results of their research. There is a strong suspicion that these researchers, when preaching about measuring the shortest time span of 247 zeptoseconds, did not provide the whole truth. They inform that the measured distance was deciphered on the basis of the photograph taken, which can be seen at https://aktuelles.uni-frankfurt.de/wp-content/uploads/2020/10/beitrag_zeitmessung_zepto_teaser_2_0.jpg (http://pinopa.narod.ru/Pomiar_odcinka_czasu.jpg). In fact, if you can decode anything from this picture, that's only then if you already know what the final result should be. And the end result is very easy to calculate. Because the speed of light in a vacuum and the distance between atoms in the hydrogen molecule H2 are known. The distance is 74 pm, or $74*10^{-12}$ m, or $740*10^{-13}$ m. The speed of radiation propagation in a vacuum is approximately 300,000. km/s, which is $3*10^{8}$ m/s. When an X-ray pulse travels a distance of $3*10^{8}$ m in 1 second, this pulse travels a distance of $740*10^{-13}$ m in $247*10^{-21}$ seconds, or 247 zeptoseconds. This is an approximate result after calculating the equation $\frac{3\cdot 10^{8}\ \mathrm{m}}{1\ \mathrm{s}} = \frac{740\cdot 10^{-13}\ \mathrm{m}}{x} \Rightarrow x = \frac{740}{3}\cdot 10^{-21}\ \mathrm{m}$.
It seems that this result became the basis for the story about measuring the shortest time span and reading it from the taken photograph.

The German physicists *2), who contributed to the announcement of the results from the measurement of the shortest time period, did not mention another important circumstance. They took into account (admittedly, in a hidden way) a constant velocity of propagation of X-ray waves in a vacuum approximately equal to $3*10^{8}$ m/s. Whereas, in the immediate vicinity of the H2 hydrogen molecule, this speed of radiation waves propagation is completely different. You can only guess what speed it is. The speed of light in the glass can be taken into account, which is about $2*10^{8}$ m/s. The concentration of matter in hydrogen atoms, from where during the experiments electrons were ejected and new sources of waves were created, could be even much greater than in the matter of glass. In the structure of glass, light waves propagate in the spaces between atoms, where there is a more rarefied form of matter than in the immediate vicinity of hydrogen or other atoms. This is evidenced by the very fact that the glass is transparent. The thermal vibrations of the atoms in the glass do not disperse the light waves, therefore the glass is transparent. Therefore, it can be assumed that the speed of the waves in the immediate vicinity of hydrogen atoms is not greater than $2*10^{8}$ m/s. Thus, in the above equation, when calculating the value of x, the number 740 should not be divided by 3, but by the number 2. For this reason, the time span measured should not be 247 zeptoseconds but 370 zeptoseconds.
As for the length of the measured time period, that would be all.

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*1) Information in German on https://aktuelles.uni-frankfurt.de/forschung/physik-zepto-sekunden-neuer-weltrekord-in-kurzzeit-messung.

*2) Sven Grundmann, Daniel Trabert, Kilian Fehre, Nico Strenger, Andreas Pier, Leon Kaiser, Max Kircher, Miriam Weller, Sebastian Eckart, Lothar Ph. H. Schmidt, Florian Trinter, Till Jahnke, Markus S. Schöffler, Reinhard Dörner