Fast Wave–Wave–Particle Triality

De Broglie wavelength uncovers the hidden structures of the Planck constant

Dr. Tamas Lajtner

Correspondence via web site: www.lajtnemachine.com

Abstract: The de Broglie wavelength describes the wave-particle duality. The de Broglie wavelength formula and the Planck law seem to be contradicted in the University of Rochester's experiment of fast light. The fast light has longer wavelengths than the "normal" light. According to the de Broglie formula, longer wavelength means smaller momentum (smaller energy) and/or increasing Planck constant. But the fast light has the same amount of energy as the normal light. It is a contradiction between the de Broglie function and the Planck law. Here we show that the 'rest action', 'rest energy' of the fast light can resolve this contradiction. This 'rest action' of the light is a new concept that hasn't been considered. It is hidden in the Planck constant. In uncovering this part we find that the Planck constant has two parts; one part shows the 'rest action', 'rest energy' of the fast light and an other part shows the 'kinetic action', 'kinetic energy' of fast light. Fast light is a kind of fast wave. The Fast Wave–Wave–Particle Triality describes a new kind of metamorphosis of matter, for example how tunneling electrons travels faster than light without violating the special relativity. Using the Fast Wave–Wave–Particle Triality, we can realize that the speed of light is not a speed limit for particles with mass, since they can be transformed into fast waves. This model allows us to preserve the special relativity while we can accept particles with mass that may travel faster than light.

Keywords: space-matter theory, fast light, fast wave, kinetic energy of fast wave, rest energy of fast wave

Wave–particle duality

Wave–particle duality is the concept that all matter can exhibit two behaviors—a particle-like behavior and a wave-like behavior. In other words, every elementary particle or quantic entity may be partly described in terms not only of particles, but also of waves. The well-known de Broglie wavelength[1] shows the connection between the momentum of the given particle (p) and the Planck[2] constant (h). See Eq. (1).

$$\lambda = \frac{h}{p} \tag{1}$$

In general, the momentum of a particle that has mass is $p = m \times v$, where m is the object's mass, and v is its velocity. The momentum of a particle that has no mass, e.g. photon is written in Eq. (2).

$$p = \frac{E}{c}, \tag{2}$$

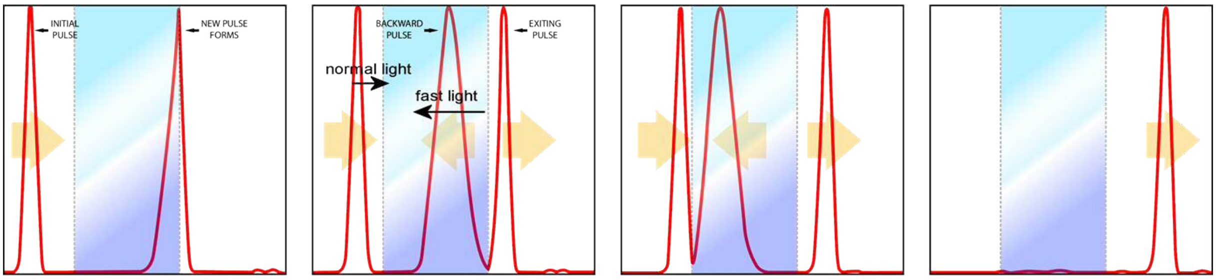
where E is photon's energy, c is the speed of light. Eq. (3) comes from Eq. (2) and the Planck law[3]: $E = h \times f$.

$$p = \frac{E}{c} = \frac{h \times f}{c} = \frac{h}{\lambda}, \tag{3}$$

where f is the frequency of the wave. Eq. (2) and (3) show that there is a close connection between the Planck law, the Planck constant and the de Broglie wavelength.

Fast light experiment at University Rochester

Figure 1. shows the fast light experiment carried out at the University of Rochester USA[4, 5]. In this experiment a fast light travels on a "normal" light. Normal light has c velocity; fast light's velocity is greater than c. $v_{fw} > c$.



As the initial pulse of light approaches the glass, a new pulse forms at the far end.

The new pulse splits in two, one traveling backward in the glass, teh other already exiting.

The backward pulse meets and cancels out the initial pulse.

Only the final pulse remains.

Figure 1. Fast light travels on a normal light. Credit: University of Rochester. Note the fast light has a longer wavelength than the normal light.

In the following many cases I use the expression "fast wave" instead of "fast light", because fast light is just one kind of fast wave. See for example the tunneling or the spooky action at a distance.

Figure 1 shows that the fast light has a longer wavelength than the normal light. This is necessary, since every light wave works using this basic law:

$$c = f \times \lambda . \tag{4}$$

According to Eq. (4) the fast wave must have a longer wavelength than the normal wave, if $f = f_{fw}$. Eq. (5) is true.

$$\lambda < \lambda_{fw} . \tag{5}$$

In the experiment the fast light meets and cancels out the normal light. It means that both lights have the same energy:

$$E = E_{fw} . \tag{6}$$

Now here we meet a problem. Let's look at the de Broglie formula.

$$p = \frac{h}{\lambda} > p_{fw} = \frac{h}{\lambda_{fw}} . \tag{7}$$

Eq. (7) shows that the two waves cannot have the same momentum, and so they cannot have the same amount of energy according to Eq. (2). But they have the same energy, since they cancel each other out.

Fast wave–wave–particle triality

Did p_{fw} and/or *h* change?

1. p_{fw} mustn't change, since the law of conservation of momentum must remain true.
2. *h* is a constant; we don't except that it changes.

Now we can conclude that the de Broglie formula is not applicable to fast waves.

Or can we rewrite the de Broglie and Planck formulas in new ways that work with fast waves?

Yes, we can. See the following equations. We know $f = f_{fw}$.

$$f \times \lambda_{fw} = v_{fw} \text{ and } f \times \lambda = c \text{, so } \frac{c}{\lambda} = \frac{v_{fw}}{\lambda_{fw}}. \tag{8}$$

$$\lambda = \frac{c}{v_{fw}} \times \lambda_{fw}, \tag{9}$$

$$\frac{h}{p} = \frac{c}{v_{fw}} \times \lambda_{fw}, \tag{10}$$

$$\lambda_{fw} = \frac{v_{fw} \times h}{c \times p} = (\frac{v_{fw}}{c} \times h) \times \frac{1}{p}. \tag{11}$$

If $v_{fw} = c$, then we get back the original formula from Eq. (11).

What does Eq. (11) mean? It means that *h* is able to change. One part of it can grow. Since *h* is a constant, it needs to have another part that decreases.

In plain English: the Planck constant has two parts. One part of it depends on the velocity of waves, this part is shown in Eq. (11). This is the part of the kinetic energy that increases *h*.

We know from the above-mentioned experiment that both lights have the same amounts of energy. So, the Planck constant must have a part that makes this result possible. There must exist a factor that reduces *h*.

Saying this, we can rewrite the Planck law in this form:

$$E_{fw} = (f_{fw} \times (h \times \frac{c}{v_{fw}})) \times (\frac{v_{fw}}{c}) = f_{fw} \times h \, . \tag{12}$$

Eq. (12) means that every particle has a 'rest action', 'rest energy'[6]. Now we can give three important conclusions:

- The rest energy exists generally; its existence is not connected to mass. The amount of the rest energy depends on the velocity of the wave or fast wave. The faster the wave, the smaller its rest action.
- The rest action (rest energy) holds the whole information that can restore the particle or wave out of fast wave. This amount of information is closely connected with the given space where the fast wave travels[7].
- The third important thing is that matter can work as space[8]. Matter is able to use another matter as space[9]. In the above-mentioned example, the normal light travels in the space, the fast light travels on the normal light that works as space.

The de Broglie formula and the Planck formula remain untouched, if $v_{fw} = c$. Using the modified de Broglie formula and the modified Planck law if $v_{fw} > c$, we have a passage between particle and fast waves. So there is a 'fast wave–wave–particle triality' instead of the 'wave–particle duality'.

What is the 'fast wave–wave–particle triality' good for?

This concept is able to explain how the tunneling and the spooky action work. In the tunneling a barrier made out of matter works as space. In this 'barrier space' the particles (for example photons, electrons) travel faster than c. Nimtz[10], Enders and Spieker have measured faster than light tunneling velocities since 1992. The tunneling electrons travel in this 'barrier space' faster than light. They seem to violate the special relativity[11]. They don't. They use the fast wave–wave–particle triality. The tunneling electron loses its mass and acts as a fast wave. When it leaves the 'barrier space' and enters 'our normal' space, it gets back its mass.
The 'spooky action at a distance' can also be described by the fast wave–wave–particle triality[12].

References

---

[1] Kirilyuk A. P. (2004) 75 Years of Matter Wave: Louis de Broglie and Renaissance of the Causally Complete Knowledge https://arxiv.org/ftp/quant-ph/papers/9911/9911107.pdf

[2] Planck, M (1901) Über das Gesetz der Energieverteilung im Normalspectrum. Annalen der Physik 4: 553-563. DOI: 10.1002/andp.19013090310

[3] Planck, M. (1900). Zur Theorie des Gesetzes der Energieverteilung im Normalspectrum Verhandlungen der Deutschen Physikalischen Gesellschaft 2, 237. DOI: 10.1002/phbl.19480040404

[4] Gauthier, D. J. and Boyd R. W. (2007). Fast light, Slow light and Optical Precursors: What does it all mean? http://www.photonics.com/Article.aspx?AID=27833.

[5] Univ. of Rochester (2006) Light's Most Exotic Trick Yet: So Fast it Goes ... Backwards? http://www.rochester.edu/news/show.php?id=2544

[6] Lajtner T. (2016) Spaces and Velocities http://vixra.org/abs/1608.0247

[7] Lajtner T. (2017) Speeds of mass and light in different spaces depend on the volume of information that the given space contains (Draft) http://vixra.org/abs/1701.0289?ref=9189575

---

[8] Lajtner T. (2017) First Clear Definitions of Space, Time and Matter http://vixra.org/abs/1703.0264

[9] Lajtner T. (2016) Thought Force Moves Real Objects—Energy Amplifier by Nature http://vixra.org/abs/1610.0373

[10] Nimtz, G. Enders, A. and Spieker, H. (1994) Photonic tunneling times. J. Phys. I France 4 565-570 http://jp1.journaldephysique.org/articles/jp1/abs/1994/04/jp1v4p565/jp1v4p565.html

[11] Nimtz, G. (2010) Tunneling Violates Special Relativity http://arxiv.org/pdf/1003.3944v1.pdf

[12] Lajtner T (2016) Four Mysteries Solved: Double-Slit, Spooky Action, Tunneling, and Accelerating Universe European-American Journal Vol 4 http://www.eajournals.org/wp-content/uploads/Four-Mysteries-Solved-Double-Slit-Spooky-Action-Tunneling-and-Accelerating-Universe.pdf