

# **A Tentative Viewpoint about the Evolution of Light Velocity**

**Ge Guangzhou**

*Harbin Institute of Technology*

*92 West Dazhi St, Nangang District, Harbin, Heilongjiang Province, China.*

## **Abstract**

At first the author put forward the Hypothesis of New Photon by interpreting the original photon with Feynman's path integral principle, based on which the author deduced that the super light velocity is possible. Then the author further tracked down the progressive evolution of light velocity from the relative light velocity to the absolute light velocity through to the super light velocity. Finally the author preliminarily came up with the idea that could possibly verify the phenomenon of super light velocity.

**Keywords:** New photon    Light velocity    Evolution

## **1. The Hypothesis of New Photon**

**According to Feynman's Path Integral Principle, although a particle may pass through countless possible paths from its start point to its finish point, among them just one path would really occur.** The author would like to use this principle to interpret the particle and thus the particle could be assumed as the unification of real path and virtual path instead of the duality of wave-particle, in which the real path is that one path that would really occur and the virtual path is the countless possible paths. And as such the photon could also be so regarded as the unification of real path and virtual path, and the photon so interpreted could be referred to as the New Photon or the Hypothesis of New Photon. In order to better depict the New Photon's behavior, the relationship between its real path and virtual path should be further formulated.

The author found that the Hamilton Principle should be able to be employed to formulate this relationship.

According to the literature of analytical mechanics, **Hamilton Principle is the variation principle which is applicable to dynamic holonomic system, that is, in the space  $(q_1, q_2, \dots, q_N; t)$  of  $(N+1)$  dimensions, the time integral of kinetic potential  $L(q, \dot{q}, t)$  of the line linking any two points will get the stationary value in its real movement path.**

Suppose

$$S = \int_{t_1}^{t_2} L(q, \dot{q}, t) dt \quad (1)$$

**S is referred to as the Hamilton action quantity, then**

$$\delta S = 0 \quad (2)$$

And then its variation form is

$$\delta S = \delta \int_{t_1}^{t_2} L(q, \dot{q}, t) dt = \int_{t_1}^{t_2} \left( \frac{dL}{dq} \delta q + \frac{dL}{d\dot{q}} \delta \dot{q} + \frac{dL}{dt} \delta t \right) dt = 0 \quad (3)$$

**And so the dynamic problem of mechanical system should come down to be a variation principle, that is, as far as the holonomic system is concerned, among all the possible movements of the system, which is conditioned by the same start and finish time, the same start and finish locations and the same constraints, the movement that enables Hamilton action quantity S to be the stationary value should be the one that really occurs in the system, and this is referred to as Hamilton Principle. Thus Hamilton Principle should depict the system's action quantity with the integral equation and use the variation method to calculate the motion equation of overall system.**

And thus the Hamilton Principle should represent the law of locating the real movement from all possible movements, or the law which determines the real path out of virtual path. Therefore, Hamilton Principle could be so employed to formulate the relationship between the real path and virtual path of the New Photon, and in the meanwhile the New Photon itself could be so represented by the Hamilton action quantity accordingly.

**2. The super light velocity is possible**

According to the literature of analytical mechanics, as far as the holonomic system of  $N$  degree of freedom is concerned, if a system's motion is depicted by  $N$  generalized coordinates of  $q_1, q_2, \dots, q_N$ , the system's motion could be equivalent to a point's motion in this space of  $N$  dimensions, and this space could be referred to as configuration space or coordinates space and this abstract point could be referred to as the configuration point. Thus the motion of configuration point in the configuration space should represent the whole system's motion, and the configuration point's path in the configuration space could be referred to as location path which is the system's motion path. And thus the motion position of every moment of the system should correspond to one point of this assumed motion path. Suppose under the active force and in the period from  $t_1$  to  $t_2$  the system moves from the location of  $A(q_{j1}, t)$  to the location of  $B(q_{j2}, t)$ , the configuration point's motion path in the augmented configuration space of  $(N + 1)$  dimensions is to be the real motion path or real path. There's but one real path and its motion equation is

$$q_j = q_j(t), j = 1, 2, \dots, N \tag{4}$$

While under the conditions of same start/finish time and same start/finish locations, any one possible motion of the particles system close to the real motion as permitted by the constraints could be referred to as the possible path or virtual path. The virtual path is countless and its motion equation is

$$\tilde{q}_j = q_j(t) + \varepsilon_j \eta_j(t), j = 1, 2, \dots, N \tag{5}$$

$\varepsilon_j$  is the arbitrary micro amount,  $\eta_j(t)$  is the arbitrary function of  $t$ , and

$$\eta_j^{(t)} \Big|_{t=t_1, t=t_2} = 0.$$

Considering the New Photon is deemed as the unification of real path and virtual path, the abstract configuration point as aforementioned should represent the New Photon and the velocity of New Photon should then be determined by its velocities along both its real path and virtual path. According to its motion equation the virtual path is

countless possible path that it means the New Photon could possibly occur simultaneously in the countless path which is depicted by the virtual path's motion equation, and then the New Photon should be able to occur in here and over there about at the same time, and thus theoretically its velocities pertaining to the countless possible path would not be hemmed in by the fixed light velocity. In the meanwhile, as the real path is originated from the virtual path as per Hamilton Principle, its velocity pertaining to the real path should also be not hemmed in by the fixed light velocity and this could be further confirmed by the motion equation of real path itself. Now that neither its real path nor its virtual path should be restricted by the fixed light velocity, the New Photon which is the unification of real path and virtual path should not be restricted by the fixed light velocity. Thus in the case of New Photon the fixed light velocity could be broken through and this phenomenon could then be referred to as the super light velocity. In addition, it should be indicated that the New Photon should eventually take the real path as its actual motion route, which should represent the sole route of the New Photon traveling from its start point to finish point, and thus it could be deduced that the real path should so represent the shortest route running between the two points located in the space.

### **3. The evolution of light velocity**

Based on the Hypothesis of New Photon, the author would proceed to look into the transitional process of light velocity which could evolve into three phases.

The first phase could be referred to as the circumstance of relative light velocity which applies to the viewpoint of absolute space time. In this case there always exists an absolutely stationary reference object which could serve as the common reference object of various moving objects or exactly the various moving objects say on the earth all have their respective relative velocities relative to the common reference object of the earth itself. In this case, the light velocity of an object as observed is actually the difference of velocities between the observed object's velocity relative to the earth's and its reference object's velocity relative to the earth's, and thus the light velocity of the observed object may change with the selection of its reference object. And thus this light velocity is relatively variable and could be referred to as the relative light velocity, which was recognized by Newton and Galileo in their eras.

The second phase could be looked upon as the circumstance of absolute light velocity which applies to the four dimensional space time of relativity theory. In this case there exists the difference between the local time and the non-local time and thus there's no

such an absolutely stationary reference object that can serve as the common reference object for any two moving objects. Thus in this case the light velocity would not be affected at all by the so called common reference object, or exactly the object moving at the light velocity would keep its velocity relatively unchanged, as should be the same even when it is traveling against another moving object which travels at a velocity that is very close to the light velocity just because there's no such a common reference object that can serve as the foundation of velocities comparison or relativity between the two objects. This light velocity is then invariable and thus could be referred to as the absolute light velocity as described by Einstein in the Principle of Light Velocity Constancy.

The third phase could be called as the circumstance of super light velocity which applies to the Hypothesis of New Photon. In this case the movement route of the new photon is just the real path originated from all its possible virtual path according to the Hamilton principle with its velocity to be determined by the motion equation of either its real path or its virtual path. Thus the system becomes self-consistent because the velocity of new photon is to be totally determined by the system itself. This light velocity could then be referred to as the super light velocity as in this case the velocity of New Photon would not be restricted by the fixed light velocity as described above, which is the light velocity as interpreted by the Hypothesis of New Photon.

In a brief summary, the interpretation of light velocity through the aforementioned three phases should reflect the transitional process of light velocity which could then be deemed as the evolution of light velocity.

#### **4. A thought experiment regarding the super light velocity**

Now that the phenomenon of super light velocity should be theoretically possible, how could this be possibly verified? The author would then roughly present an idea of thought experiment regarding the design of an aircraft.

Considering the design of an aircraft, which would fly to the Mars or other stars from the earth, what occurs first is probably how fast the aircraft should travel or what orbit/route the aircraft should follow?

There's a question identified here if it's the velocity of the aircraft that should determine its movement orbit, or on the contrary it's the aircraft's orbit that should determine its velocity?

Generally it seems like the velocity is more important than the orbit, that is, the aircraft should at first reach certain velocities as required to break away from the constraints exerted by the gravity of the earth or sun, and then it could subsequently travel at the given orbits at the corresponding velocities, and eventually fly to the destinations as planned.

However, on the other hand how should we design the given orbits? Or exactly is it possible to design the aircraft's orbit so that it could possibly affect the aircraft's velocity? Or further, what if we design the aircraft's given orbit to make it travel along the real path as determined by Hamilton Principle?

Based on the super light velocity, if the orbit is to be designed as per the real path as determined by Hamilton Principle the movement velocity of the system or its configuration point would not be restricted by the fixed light velocity and the case of super light velocity should then apply to the aircraft's movement and the aircraft will so break through the limitation of fixed light velocity.

Thus in here it's not the velocity that determines the orbit but on the contrary the orbit that determines the velocity, as could be identified as above as the most significant feature of the design of this aircraft.

Therefore, the key to the design of this aircraft is at first locating the appropriate routing as the given orbit, specifically the aircraft should be designed to follow the real path as determined by Hamilton principle, and then we could see how long it would take this aircraft to arrive at the Mars or any other stars when the so called fixed light velocity would not be the limitation of flying the aircraft. The author believes this should be a very interesting experiment with its mechanism being the principle that the real path should be taken as the shortest routing between any two points in space.

## **REFERENCES**

- [1] Feynman, Richard P., Hibbs, Albert R., Styer, Daniel F.,(2010). Quantum Mechanics and Path Integrals. Mineola, NY: Dover Publications. ISBN 0-486-47722-3.
- [2] Analytical Mechanics, L.N. Hand, J.D. Finch, Cambridge University Press, 2008, ISBN 978-0-521-57572-0.