WHY THERE IS AN ABYSS BETWEEN THE QUANTUM AND EINSTEIN' S RELATIVITY THEORY: HUMAN PERCEPTION AND SPACE-TIME AS APRIORY FORM OF HIS CONTEMPLATION

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In given paper it has been shown that there is a deep connection between fundamental inequalities of the quantum mechanics $\Delta p\Delta x \leq h$ and the Einstein relativity theory $v \leq c$.

Key words: foundation of space and time, observation in quantum physics, Heisenberg's principle of uncertainties, constant speed of light, Doppler's and Compton's effects.
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INTRODUCTION

In all sciences there is an observation. But the observation is the purposeful perception. The famous physicist Wigner has written [1]:"The separation our perception and law of nature is no more than simplification. Although we are convinced of it is of harmless character but nevertheless we ought not to forget about it". Really, it is show us our quantum measurements too. Problem of human perception is important not only for physics but cognition theory and computer sciences.

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But would be the perception of micro world by our devices whole? In all sciences there is an observation. But the observation is the purposeful perception. The famous physicist Wigner has written [1]:"The separation our perception and law of nature is no more than simplification. Although we are convinced of it is of harmless character but nevertheless we ought not to forget about it".

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But would be the perception of micro world by our devices whole? It is not, of course!

It is important to agree that the observation in macro world, for example, sunrise and the observation in micro world, for example, the changing some numbers on the device aren't the same. The imagination what, how process is behind of these numbers on the device depends on the level of scientific knowledge of human. But the scientific knowledge depends on the reflection reality in the human's consciousness.

That is why the consciousness of observer takes place in quantum mechanics. More full knowledge demands not to consider separately the physical phenomena and phenomena of thinking, consciousness. As Wigner has written it is necessary is to establish the limit of our ability to percept surrounding world. The perception of macro world by not devices results in that there is no theoretically uncertainties at determining impulse p and coordinate x of particle, i.e. Δp and Δx can be theoretically equal 0 and therefore $\Delta p\Delta x=0$, more exactly $\Delta p\Delta x \leq h$. The famous philosopher Hegel would say that such being is being as it is [3]. Being as it is because it is perceived directly from our sensual organs.

But the no whole perception of micro world by devices results in that there is uncertainties at determining impulse p and coordinate x of particle, i.e. Δp and Δx don't equal 0 the same time. If one of them equals to 0 then another is infinity 0 and therefore $\Delta p\Delta x>h$,where h is Planck's constant. This inequality shows us where the perception of micro world began and plank constant h is that limit about that say Wigner above.

Thus if $\Delta p\Delta x \leq h$ then the surrounding world is perceived by us habitually (usually). Here there are macroworld and the classical physics. On the contrary if $\Delta p\Delta x \geq h$ then the surrounding world is perceived by us unhabitually (unusually). Here there are microworld and quantum physics.

So, the ambiguous perception of micro world results in that the knowledge or physics become another. The various perceptions mean different forms and levels of reflection which are presented by various kinds and levels of consciousness. Therefore in the micro world observer's consciousness is differed from one in the macro world, i.e. from usual consciousness and this difference results in that the consciousness must be accounted and, in fact, it is accounted in the quantum mechanics. Is there another, besides Plank constant h, limit corresponding our ability perceive the surrounding world? Yes, there is and it is a velocity of light c.

From the philosophy it is known that space and time are apriori forms of contemplation [4].

The development of the relativity theory results in such conclusions that following from experiments objective properties of space and time are reflected just by Lorentz transformations. Therefore the principal postulates of this theory says us that any physical law must satisfy Lorentz transformations and if $v \geq c$ then

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Lorentz transformations lose me sense. Therefore always the body motion velocity $v \leq c$. Hegel would say that it is mediocre essence. It is mediocre because we do its such, suitable for us. Thus if $v \geq c$ then the objective properties of space and time are lost and it means loss of our ability to contemplate the world around, i.e. in this case there isn't a experience.

Is there a connection between the inequalities of quantum mechanics $\Delta p \Delta x \leq h$ and relativity theory $v \leq c$?

Any will say that the source of knowledge is an experience. But is knowledge product of only experience? Empiricism accounts that it is true. No knowledge without feelings and experience can arise (R.Bekon). Rationalism considers that it isn't true. Only the reason. (Dekart). Kant of genius taking between them, understood that the reason can not contemplate and the sense can't think. Therefore they both, experience and reason, important to scientific knowleadge [4].

Usually we account that the experience consist of only aposteriori elements. In it Kant sees its incompleteness. Kant has said that if we want to give experience finished character then we must announce that the experience consist of both the aposteriori elements and apriori elements. Aposteriori elements are sensations which we receive after experience. But what will be an aprioristic element of experience? Kant has understood it is not sensations which as result of influence must be only aposteriori. He has understood that this element is necessarily connected with consciousness of the person, namely with speculation, contemplation. As it is known from philosophy the contemplation is the direct relation consciousness to the object. It seems us that direct relation consciousness to the object takes place in only case when the object appear us. But Kant has said that it is empirical contemplation. In order to separate from it the apriori contemplation Kant has introduced the following conception: phenomenon, substance, form, space and time. What is being, appear to us, is the object of empirical contemplation. In the phenomena Kant has differed substance and form. The matter of phenomenon is the variety of sensations. This variety is organized and regulated by mean of form of phenomenon, i.e. contemplation. It is appropriate to note once more that Kant has postulated that the reason can not contemplate and therefore, unlike Dekart, he has accounted that the contemplation must be only sensual. Kant has said that contemplation is important moment of the sensuality and his apriori contemplation is the sensual too, but no sensual sensuality, but reason sensuality. Kant has accounted that contemplations are both real and ideal. The contemplations are real because they give a chance to be experience. The contemplations are ideal because they exist before experience. In fact, there must be this property (apriori contemplation) in the subject in order to arise the direct notion about object in consequence the reflection of object in subject, consciousness. If this property would absent in subject then the reflection will not equal to the representation. Every time it would be diffently.

But what are the forms of apriory contemplation?

Kant has accounted that it is space and time. Being in form of "pure contemplation" they before all things and phenomena are in the human soul in the ready-made state. By means of them the real world is reflected in our reason. It is appearing us what is organized by means of space and time. One can say experience is as dough to laid in cookies cutter or as waves, only some of them can be received by the receiver depending from nature of receiver. Therefore Kant says that it is cognized what is come, appeared, phenomen, and they aren't "things-in-themselves". "Things-in-themselves" take place behind the limit (boundary) of the phenomen, contemplation and therefore it isn't cognized by us. It testifies about boundary of our cognition. Kant of genius has known that knowledge going out experience is possible. In other words, the waves some of which can't be received by the receiver. Thus Kant has say there are knowledge in two forms – empirical and theoretical. The theoretical knowledge – knowledge without contemplation, knowledge about objects comprehended by reason (Kant called them noumens) is possible. But this knowledge never can be phenomen. Kant has written:" The contemplation ties sensual impressions and creates from them the phenomenon: the phenomena are product of our contemplation and object of the mind (reason). The mind connects phenomena and creates from them the cognition…" So, the sensual impressions are tied by the contemplation whose apriori forms (space and time) are in our soul or reason in ready-made condition. But which space and time? This question isn't put by Kant because at past it was known only one geometry – geometry of Euclid. Therefore Kant has accounted that it is euclidean space. He has emphasized once for all that without fail our intellect organize our space sensations in accordance with law of euclidean geometry. Kant says that our reason already owing forms of euclidean space lays them on received sensual impressions which after that are organized, regulated by the ready schemes. These schemes are apriori synthetic knowledge, for example such statement as "straight line is the shortest distance between two points" or "the plane is determined by three points which isn't on the straight line" or famous euclidean axiom about parallel lines are automatically being put in our reason [5]. However from other geometries – geometry of Lobachevski, Riemann, etc. these schemes can be quite another.

Why is Kant's philosophy so attract for computing sciences? Because in entry of computer there is a program too, as space and time in our mind, transforming things of the our world in things of its computer's world. May say human's real world becomes computer's virtual one. Without understanding Kant's philosophy it is not understand the cognitive science deeply for Intelligence Technology. It began in the early 1980, when researchers in computer science adopted the information-processing paradigm as the model of human cognition. This article is not from the computer science directly, but may be our analyses of human cognition in physical theories can help to it.

Therefore the question: “What kind of space and time is in our soul, intellect?” becomes very actual. It is very interesting what Kant would say if he knew about these geometries consequently another kind of space and time – other forms of apriority contemplation. Maybe, he would say that form of apriority contemplation with which we deal in our direct experience is the usual for us space and time – euclidean space. But if there are other forms of apriority contemplation – unusual for us space and time, then by means of them can be organized theoretical noumens that aren't phenomens, doesn’t come directly to us in experience, but come to us through devices (instruments, apparatus). The question, that knowledge is possible in this case, can be answered by modern philosophers words[6]: "It is also possible real knowledge about such objects which aren’t directly given in our human experience. With such objects are dealt both modern micro physics and cosmology”. In other words, one can contemplate object that don’t come to us in direct experience and giving of this object will be organized by another way – another space and time. In fact, in the Einstein's relativity theory another form of apriori contemplation is the space of Minkovski, today say about Finsler's space too. As it was said above, the followed from experiments objective properties of space and time are reflected by Lorentz transformations. In order that these transformations are carried out it is necessary that v≤c.

Thus, in spite of space of Minkovski, Finsler are quite another form of apriority contemplation nevertheless they have objective properties, but unlike usual space and time, i.e. euclidean space, they satisfy non Halliley transformations, but Lorentz transformations. It is clear that if v≥c then objective properties of space and time are lost. But what does mean the objective properties of space and time from more deep point of view. It is the properties of such space and time which are concerned to the usual contemplation. But what is unusual contemplation? It is the unusual relation of consciousness to the object and therefore unusual way of the given to us appearance which is already organized no just another bur unusual form of apriori contemplation. In this case the space and time have non objective properties, i.e. properties not following from our experiments.

Is the knowledge possible in this case? Kant would answer this question that not, because the knowledge coming out boundary of experience can’t be actual. Therefore it will be better if one is limited by experience – directly or non directly one. However Hegel would say that knowledge not only can but also must go out boundary of experience because in only this case we can understand essence of being. Thus we have analyzed the notions of space and time from philosophical point of view. In the relativity theory the notions of space and time are important. According to this theory the objective properties of space and time take place in case when $v \le c$. Also from philosophical point of view we have considered the problems connected with perception and said in our macro world there is $\Delta p \Delta x \le h$.

We have understood that when we don’t deal with direct experience i.e. micro world then the reflection is differed from usual reflection. Corresponding to this case the no whole reflection, perception was being tied with Heisenberg uncertainty principles ($\Delta p \Delta x \le h$).

The perception and the contemplation are deeply connected with each other. In fact, as it is spoken above by means of contemplation apriority from of which is space and time it is appear direct notion about object. The notion is connected with perception because the notion (image) is form of early perceived object or phenomena. So, the space and time are kinds of perception. Therefore one can say that inequalities $\Delta p \Delta x \le h$ and $v \le c$ are connected with each other and this connection is the evidence of unity of micro and macro words laws. It is very interesting to remember the following. At past Hegel has said that mediocre essence (here $v \le c$) and direct being ($\Delta p \Delta x \le h$) separately taken not yet keep real knowledge about object. The essence and the being must be considered in connection with each other, in such one, when from essence it is explained its phenomena or the being.

Thus let’s consider the following connections:

1) $\Delta p \Delta x \le h$ and $v \le c$. This case correspond to the no relativistic macro world. Here, as Hegel said, the direct being and the mediocre essence

2) $\Delta p \Delta x \ge h$ and $v \le c$. This case correspond to the no relativistic micro world.

3) $\Delta p \Delta x \le h$ and $v \ge c$. This case isn’t possible. Here, the unusual contemplation of perceived macro world take place. This fact is postulated by the relativity theory too.

4) $\Delta p \Delta x \ge h$ and $v \ge c$. This case is possible. Here, the unusual contemplation of no whole perceived micro world take place.

Thus, in case 3) we see that philosophy confirm the conclusion of relativity theory about body motion velocity. Sometimes the philosophy can draw a conclusion before the natural science do it. For example, in 1846 year Kant wrote that three dimensionality of our space follows from character of Newton’s law of universal gravitation. It is quite true, but it was proved by physicists no sooner than many years after Kant. Immanuel Kant has tell that from another law of gravitation would follow another structure of space, another number of measurements and if it is really possible then it is probably the God arrange it somewhere yet. From philosophical point of view it is very interesting the case 4). This case is just that case which, as Kant considered, go out the limit of experience. Here, the knowledge going out the boundary of experience can’t be true. Therefore in Kant’s philosophy the case 4) doesn’t take place. However in Hegel’s philosophy this case not only take place but also attract his attention. Here, Hegel could say, the knowledge not only can, but must go out the boundary of experience because in just this case we can comprehend the essence of things.

Let’s consider the case 1), when $\Delta p \Delta x \le h$ and $v \le c$. Let’s assume $x = vt$. However it isn’t supposed that movement is uniform, i.e. $\Delta v \ne 0$ and $\Delta x = v\Delta t + t\Delta v$. We are distinguishing from each

other observers which is moving and which is rest or one can say that system in which the measurements take place is moving and that is rest. So, $m\Delta v(v\Delta t + t\Delta v) \le h$. Hence, $v \le \frac{h}{m\Delta v\Delta t} - \frac{\Delta v}{\Delta t}t$. On the another hand, $v \le c$. Therefore $\frac{h}{m\Delta v\Delta t} - \frac{\Delta v}{\Delta t}t = c$. Consequently, $t(\Delta v)^2 + c\Delta t\Delta v - \frac{h}{m} = 0$. Let's find the solutions Δv of this quadratic equation. So, $(\Delta v)_{1,2} = \frac{-c\Delta t \pm \sqrt{D}}{2t}$, where $D = c^2(\Delta t)^2 + \frac{4ht}{m}$. It is clear that solution $\Delta v_2 \le 0$ doesn't our conditions. We take an interest in $\Delta v_1 \ge 0$ solution and therefore $\Delta v = \frac{-c\Delta t + \sqrt{D}}{2t} = \frac{-c\Delta t + \sqrt{c^2(\Delta t)^2 + \frac{4ht}{m}}}{2t}$ (1). As it is clear, in macro world in determining the velocity Δv there is a uncertainty. But in which phenomenon of macro world we can see this uncertainty, but not perceiving it as uncertainty?

It is clear that this phenomenon must be kinematics. The kinematics is the part of mechanics in which the geometrical motion of body is being studied. Therefore, in the kinematics the space and time are principal notions. As it was said above, the space and time are various kind of perception. It is known that Dopler's effect is the phenomenon of kinematics. Directly perceived by us this effect is Dopler effect in acoustics. The sound source is considered in two cases, when it is rest and it is moving, for example toward observer with velocity *v*. The velocity of the sound wave is the same in both case (*V*). However, the sound frequency *w* which is perceived by observer depends from source motion velocity *v*. The formulae describing this dependence the following: $w = \frac{w_0}{1 - \frac{v}{V}}$ (2). This effect can be analyzed by us from point of view of the unity of the macro and micro worlds laws and therefore there is uncertainty in macro world too. This uncertainty can be seen by us in the velocity *v* of the source. This velocity *v* can be considered as Δv. We don't perceive it as uncertainty because there is Dopler's effect by means of which we find *v* exactly. If macro world wasn't wholly perceived by us, then Dopler's effect would not be observed. Really does not it look like that, as Hegel said, from the essence (macro world is perceived) it is explained its phenomena (by Dopler's effect), the being. From the relativity theory it is known that the time of event isn't the absolute value. It can be understood if we are distinguishing from each other observers which is moving and which is rest or one can say that system in which the measurements take place is moving and that is rest. In the formula $\Delta x = v\Delta t + t\Delta v$ because of $\Delta v \ne 0$, the factor t of Δv must be differed on depending of measurements of momentum. Therefore, $t_1 \ne t_2$ and, consequently, $\Delta t \ne 0$. By comparing the formulae obtained by us it can be obtained the formula for Δt. From formula (2) we have: $\Delta v = V\left(1 - \frac{w_0}{w}\right)$ (3). Comparing the formula (1) with (3) we obtain:

$$V\left(1 - \frac{w_0}{w}\right) = \frac{-c\Delta t + \sqrt{c^2(\Delta t)^2 + \frac{4ht}{m}}}{2t}.$$

From this formula we obtain:

$$\Delta t = \frac{\frac{h}{m} - tV^2\left(1 - \frac{w_0}{w}\right)^2}{cV\left(1 - \frac{w_0}{w}\right)}.$$

In the macro world $\frac{h}{m} \to 0$ and therefore: $\Delta t = \frac{tV\left(\frac{w_0}{w} - 1\right)}{c}$ (3). In the case of non relativistic macro world when the body motion velocity, in that number the velocity of wave in Dopler's effect, is very less than the velocity of light ($V << c$), then $\Delta t \to 0$. Therefore at perceiving non relativistic macro world, world in which velocities body, wave sources and waves themselves are very less than light velocity, the time of events are absolute. However, if in this world it is considered the source of no sound, but light then quite another act, i.e. $\Delta t = t\left(\frac{w_0}{w} - 1\right)$. Therefore, the contemplation of light by observer, i.e. the reference of consciousness to light, light phenomena is very unusual. Due this we can say that in any inertial system the light velocity is constant. Really, this fact is postulated by the relativity theory.

Now, let's consider the Dopler's effect in the relativistic macro world. In this case the effect of relativistic slowing-down of time take into account. It is known the formula $w = \frac{w_0}{\left(1 - \frac{v}{V}\right)\gamma}$, where $\gamma = \left(1 - \frac{v^2}{c^2}\right)^{-1/2} = \frac{c}{\sqrt{c^2 - v^2}}$. As we have spoken above, *v* is represented as Δv. Thus, for this case in the previous calculations in formula (3) the factor γ before ω take place:

$$\Delta t = \frac{tV\left(\frac{w_0}{w\gamma}-1\right)}{c} = \frac{tV\left(\frac{w_0\sqrt{c^2-\Delta v^2}}{wc}-1\right)}{c}.$$

Thus, $\Delta t = \frac{tV\left(w_0\sqrt{c^2-\Delta v^2}-wc\right)}{wc^2}$. Here $\Delta v \to c$ and therefore $\Delta t = \frac{-tV}{c}$. Let's compare this formula with formula (3), i.e. let's compare the relativistic case ($\Delta v \to c$) with the non relativistic case. The transition from non relativistic case to relativistic case is marked by that the factor $\left(\frac{w_0}{w}-1\right)$ will be equal to -1. Therefore $\frac{w_0}{w}$ =0 and, consequently, $w \to \infty$. Therefore if the source of oscillations (any waves) moves, with the velocity near velocity of light, towards observer (we have analyzed this case) or opposite (at analyzing this case we would such calculations as well) then the frequency of wave w perceived by observer will be greater than frequency of wave w_0, given off by the source itself. Thus, the perception of the relativistic world, i.e. world with velocities near light velocities, by observer is very differed from usual perception. In the relativistic world if the source gives off light then $\Delta t = -t$ (the case of drawing near source) and $\Delta t = t$ (the case of going away source). We satisfy oneself once again that in any case (relativistic or non relativistic) the contemplation of light is unusual.

Now let's consider the second case, when $\Delta p \Delta x \geq h$ and $v \leq c$. this case corresponds to non relativistic world. As in previous case, let's make transformation. So, $v \geq \frac{h}{m\Delta v \Delta t} - \frac{\Delta v}{\Delta t}t$. Taking into account $v \leq c$ we obtain: $\frac{h}{m\Delta v \Delta t} - \frac{\Delta v}{\Delta t}t \leq c$. Transforming this inequality we obtain: $\Delta v \Delta t \geq \frac{h}{mc} - \frac{(\Delta v)^2 t}{c}$ (4). Consequently, $\Delta v \Delta t \geq \frac{h}{mc}$, where $\frac{h}{mc}$ is the Compton's wave length of particle λ_k, i.e. it is the wave length before the scattering.

The equation(4) can be presented as:

$$\Delta v \Delta t = \frac{h}{mc}\left(1 - \frac{m(\Delta v)^2 t}{h}\right).$$

Can we say that Δv is v? Most likely, if we remember that above mentioned case we consider v as Δv due to effect of perception. Let's assume that we perceived micro world as whole world. Then Δv will not be presented as uncertainty. During time interval Δt we can find the distance without uncertainty and it is possible due to whole reflection to our sensual organs. Then $v\Delta t = \Delta\lambda$.

Let's remember that Compton's effect is the scattering of electromagnetic wave which is accompanied by decreasing frequency. $\Delta\lambda = \lambda' - \lambda = \frac{h}{mc}(1-\cos\alpha)$, where λ and λ' are wave lengths before and after scattering, α is the angle of scattering. Thus, the Compton's effect is effect of micro world which get rid of uncertainty in our whole perception of macro world. Really, our skill of finding wave lengths before and after scattering testifies about it.

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