

Macro- and micro worlds from the point of view of perception: different levels of reflecting in observer's consciousness

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Abstract

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

The explanation of nature of Heisenberg uncertainty principles is of a great interest. It can be understudied, gone without saying, if we will turn our attention to philosophical conceptions of perception, reflection and observation [1]. The famous physicist Wigner has written [2] that in order to obtain full scientific knowledge it is necessary to understand more deeply the observation and perception processes. The perception as "visual thinking" arises in consequence of spontaneous (as it is) influence of objects of real world to our sensual organs. This form of cognition is main and point of departure in cognition process. But some physicist account that scientific cognition is to obtain only objective knowledge existing out of separate individual, for example, some scientific text. One can answer by means of following Wigner's notice: "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". The perception is the whole (integer) reflection of objects, phenomena, events in consequence of spontaneous influence to sensual organs. But is the perception of micro world whole? It is not, of course! Invisible world of micro particles can't spontaneously, directly affect to our organs and therefore it is perceived by means of devices. Of course, the result of it is no whole reflection to consciousness of man. 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 understanding of what, how process is behind of these numbers on the device depends on the level of scientific knowledge of man. Thus the perception of macro world by man doesn't depend on standard of scientific knowledge but that of micro world does. As it is known from philosophy the scientific knowledge is the reflection of objective characteristics of reality to man's consciousness. Therefore the level of scientific knowledge depends on the level of reflection. From philosophy it is known that different forms and levels are presented by various kinds and levels of consciousness. The end therefore the perception of micro world depends on consciousness of man. That is why the consciousness of observer takes place in quantum mechanics. More full knowledge about which has been written by Wigner demands not to consider separately the physical phenomena and phenomena of thinking, consciousness. As Wigner has written the decisive step to such knowledge is to establish the limit of our ability to percept surrounding world. It is clear that this limit is finished by perception of our world – macro world that we see, hear, and feel. In fact the whole perception of macro world results in that there is no uncertainties at determining impulse p and coordinate x of particle, i.e. Δp and Δx 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. The no whole perception of micro world results in that there is uncertainties at determining impulse p and coordinate x of particle, i.e. Δp and Δx don't equal 0, more than 0 and therefore $\Delta p \Delta x > 0$. The more exact quantitative tie between Δp and Δx was established by Heisenberg, i.e. $\Delta p \Delta x \geq h$. This inequality shows us where the perception of micro world began and plank constant h is that limit about that Wigner says above and that corresponding our ability perceive the surrounding world.

Thus if $\Delta p \Delta x \leq h$ then the surrounding world is perceived by us habitually (usually), i.e. simplify and this world is macro world and applicable physics is the classical physics. On the contrary if $\Delta p \Delta x \geq h$ then the surrounding world is perceived by us unhabitually (unusually), i.e. there is a ambiguity and such world is micro world and applicable physics is the quantum physics. The just ambiguous perception of micro world results in that the perception become another. The various perceptions mean different forms and levels of reflection which, as it is mentioned above, 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 reality, it is accounted in the quantum mechanics. Is there another, with the exception of 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 Lorentz transformations lose me sense. Therefore always the body motion velocity $v \leq c$. Hegel would say that it is mediocre essence. One 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 physicist will not argue that the source of knowledge is an experience. But is knowledge product 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 intellect (mind) can give knowledge generality and necessity (Dekart). Kant of genius taking none of them side, but between them, understanding that the reason can not contemplate and the sense can't think have said the following. 1) the experience have unfinished character, 2) the mind perfect knowledge [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 that 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 understand what contemplation is and to separate from it the apriori contemplation Kant has introduced the following conception: phenomenon, substance, form, space and time. What appeared us is the object of empirical contemplation. In the phenomena Kant has differed substance and form. The matter of phenomenon is the sensations or 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 as for as apriori contemplation is no sensual 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 influence of object on subject. If this property would absent in subject then the influence will not equal to the notion. But what are forms of apriority contemplation? Kant has accounted that it is space and time. Being in

form of “pure contemplation” they already take place in the soul in the ready-made condition. By means of them (space and time) it is organized the first given to us appearance. In other words, it is come, appeared us what is organized by means of space and time. One can say that experience as paste is laid in the ready cake size (mould) or as waves some of which can be received by the receiver. Therefore Kant says that it is cognized what is come, appeared, but they aren't “things-in-themselves”. “Things-in-themselves” take place behind the limit (boundary) of the 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 paste that is not laid in the ready cake size(mould) or the waves some of which can't be received by the receiver. Thus first of all Kant has put the problem of existence knowledge in two forms – the empirical knowledge (into experience) and the theoretical knowledge (out of experience). He has said that the theoretical knowledge – knowledge without contemplation, knowledge about objects comprehended by mind (Kant called them noumens) is possible. But this knowledge never can be original, general. 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, intellect 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 was convinced that our mind 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 put in our intellect [5]. However from appearance other geometries – geometry of Lobachevski, Riemann, etc. it is clear that these schemes can be quite another. Therefore the question: “What kind of space and time is in our soul, intellect?” becomes very interesting. 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 such way of the first given to us appearance that 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 relativity theory another form of apriori contemplation is the space of Minkovski, Finsler, etc. 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 $v \leq c$. 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 Galilei transformations, but Lorentz transformations. It is clear that if $v \geq c$ 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. That is the properties of such space and time which are concerned to the usual contemplation. But what is unusual contemplation? The unusual contemplation is the unusual relation of consciousness to the object and therefore unusual way of the first given to us appearance which is already organized no just another but unusual form of apriority 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 $v \leq c$. Also from philosophical point of view we have considered the problems connected with perception [7]. We have understood that when we don't deal with direct experience i.e. micro world then reflection is differed from usual reflection. This no whole reflection, perception was tied with Heisenberg uncertainty principles ($\Delta p \Delta x \leq h$). 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 $\Delta p \Delta x \leq h$ and $v \leq c$ 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 $v \leq c$) and direct being ($\Delta p \Delta x \leq h$) 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 connection:

- 1) $\Delta p \Delta x \leq h$ and $v \leq c$. This case correspond to no relativistic macro world. Here, as Hegel said, the direct being and the mediocre essence
- 2) $\Delta p \Delta x \geq h$ and $v \leq c$. This case correspond to no relativistic micro world.
- 3) $\Delta p \Delta x \leq h$ and $v \geq c$. 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) $\Delta p \Delta x \geq h$ and $v \geq c$. This case is possible. Here, the unusual contemplation of no wholly 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 Kant wrote that three dimensionality of our space follows from character of Newton's law of universal gravitation. It is quite true, but it is proved by physicists no sooner than many years after. Kant has confirmed 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. 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, 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 $\Delta p \Delta x \leq h$ and $v \leq c$. Let's assume $x = vt$. However it isn't supposed that movement is uniform, i.e. $\Delta v \neq 0$ 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, $m \Delta v (v \Delta t + t \Delta v) \leq h$. Hence,

$$v \leq \frac{h}{m \Delta v \Delta t} - \frac{\Delta v}{\Delta t} t. \text{ On the another hand, } v \leq c. \text{ Therefore } \frac{h}{m \Delta v \Delta t} - \frac{\Delta v}{\Delta t} t = c. \text{ Consequently,}$$

$$t(\Delta v)^2 + c \Delta t \Delta v - \frac{h}{m} = 0. \text{ Let's find the solutions } \Delta v \text{ of this quadratic equation. So,}$$

$(\Delta v)_{1,2} = \frac{-c\Delta t \pm \sqrt{D}}{2t}$, where $D = c^2(\Delta t)^2 + \frac{4ht}{m}$. It is clear that solution $\Delta v_2 \leq 0$ doesn't our conditions. We take an interest in $\Delta v_1 \geq 0$ solution and therefore $\Delta v = \frac{-c\Delta t + \sqrt{D}}{2t} =$

$$\frac{-c\Delta t + \sqrt{c^2(\Delta t)^2 + \frac{4ht}{m}}}{2t} \quad (1).$$

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 existing also uncertainty in macro world. 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 (on hand 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 $\Delta v \neq 0$, the factor t of Δv must be differed on dependence of measure momentum. Therefore $t_1 \neq t_2$ and, consequently, $\Delta t \neq 0$. 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:

$$V \left(1 - \frac{w_0}{w}\right) = \frac{-c\Delta t + \sqrt{c^2(\Delta t)^2 + \frac{4ht}{m}}}{2t}. \quad \text{From this formula we obtain:} \quad \Delta t = \frac{\frac{h}{m} - tV^2 \left(1 - \frac{w_0}{w}\right)^2}{cV \left(1 - \frac{w_0}{w}\right)}.$$

In the macro world $\frac{h}{m} \rightarrow 0$ 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 more less than the velocity of light ($V \ll c$), then $\Delta t \rightarrow 0$. Therefore at perceiving non relativistic macro world, world in which velocities body, wave sources and waves themselves are more 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. Therefore in any inertial system the light velocity is constant. Really, this fact is postulated by the relativity theory. Now, let's consider the Doppler'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 $\Delta v \rightarrow c$ and therefore $\Delta t = \frac{-tV}{c}$. Let's compare this formula

with formula (3), i.e. let's compare the relativistic case ($\Delta v \rightarrow c$) 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, $w \rightarrow \infty$. 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 Kompton'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 Kompton'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 Kompton'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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