Heisenberg's uncertainty principle

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Abstract. The uncertainty in the measurement of a particle's position and momentum as the cause of the particle-electron movement is interpreted. Specifically, the rapid decreasing fluctuation amplitude A, as a function of the distance x from the electron, is the cause of the uncertainty in the measurement. Therefore, we have to express Heisenberg's uncertainty principle $\Delta p \Delta x \geq \hbar$ with ΔA and Δx, i.e. replacing the momentum difference Δp with the amplitude difference ΔA.

Keywords: Inductive phenomenon; grouping units; fluctuation amplitude.

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1. Inductive phenomenon create pressure difference ΔP as motion arrow

According to the unified theory of dynamic space[1,2] in a changing motion of an electron a shift of electric units[3] of the proximal space is caused and a difference ΔP of space cohesive pressure[4] is created. This shift of units, at a proximal area of an electron, is due to the inductive phenomenon.[5]

The magnetic forces are described as electric ones created by grouping units[5] of the moving electron (Fig. 1), due to the above inductive phenomenon. If Q is a moving electric charge at speed u, while Q_1 is the respective electric charge of its grouping units, then it is obvious that

$$Q_1 = KQu, \tag{1}$$

where K is a ratio constant. We put in Eq. 1 the electron speed

$$u = u_a C_0, \tag{2}$$

where u_a is the respective timeless speed[6] and C_0 the light speed,[7] then

$$Q_1 = KQu_aC_0. \tag{3}$$

As u_a is dimensionless value then, due to Eq. 3, it should obviously apply

$$KC_0 = 1 \Rightarrow K = \frac{1}{C_0} \tag{4}$$

and so Eq. 3, due to Eq. 4, becomes

$$Q_1 = Qu_a \Rightarrow u_a = \frac{Q_1}{Q} \Rightarrow u_a^2 = \frac{Q_1^2}{Q^2}. \tag{5}$$

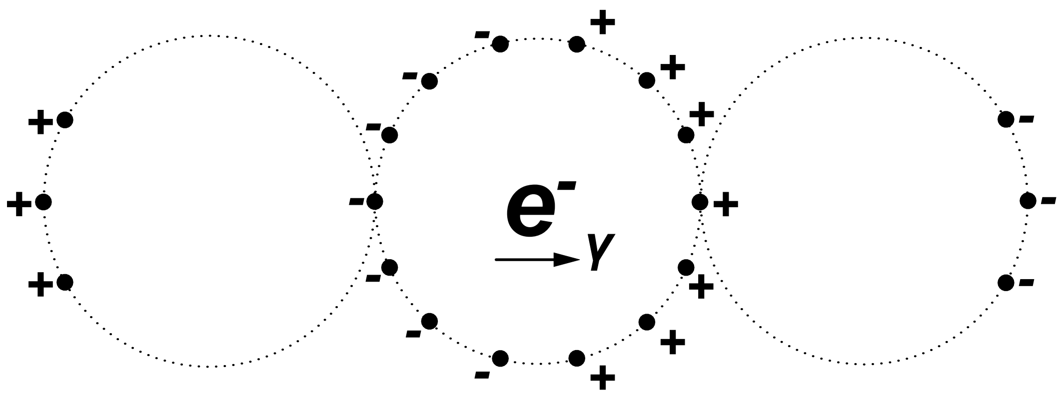

Figure 1. The first grouping units and their reproduction extra grouping units as second ones

However, the timeless speed has been found as a function of the pressure difference[5] ΔP on both sides of the formation of the first grouping unit and of the cohesive pressure P_0, namely it is

$$u_a = \sqrt{\frac{\Delta P}{P_0}} \Rightarrow u_a^2 = \frac{\Delta P}{P_0}. \tag{6}$$

Therefore, due to Eqs 5 and 6, it is

$$u_a^2 = \frac{Q_1^2}{Q^2} = \frac{\Delta P}{P_0} \Rightarrow \Delta P = P_0 u_a^2 \Rightarrow \frac{\Delta P}{2} = \frac{P_0}{2} u_a^2. \tag{7}$$

2. Decreasing fluctuation amplitude of motion wave

The time and spatial fluctuation of the spherical formation of the first grouping unit implies a harmonic change in the difference[6] ΔP of the cohesive pressure. Therefore, the first maximum amplitude A_1 (Fig. 2) of the pressure fluctuation $\Delta P/2 = P_0 u_a^2/2$ (Eq. 7) will be

$$A_1 = \frac{\Delta P}{2} = \frac{P_0}{2} u_a^2 \Rightarrow A_1 = \frac{P_0}{2} u_a^2 \tag{8}$$

and for $u_a^2 = Q_1^2/Q^2$ (Eq. 5), then Eq. 8 becomes

$$A_1 = \frac{P_0}{2} \cdot \frac{Q_1^2}{Q^2}. \tag{9}$$

The electric charge of the second grouping unit, due to Eq. 5, becomes

$$Q_2 = Q_1 u_a. \tag{10}$$

The fluctuation amplitude A_2 decreases, keeping in denominator the accelerated electric charge Q (Eq. 9) as the operative cause of the phenomenon, that is

$$A_2 = \frac{P_0}{2} \cdot \frac{Q_2^2}{Q^2}. \tag{11}$$

By replacing the electric charge $Q_2 = Q_1 u_a$ (Eq. 10) of the second grouping unit in Eq. 11, the fluctuation amplitude A_2 becomes

$$A_2 = \frac{P_0}{2} \cdot \frac{Q_2^2}{Q^2} = \frac{P_0}{2} \cdot \frac{Q_1^2}{Q^2} u_a^2 \Rightarrow A_2 = \frac{P_0}{2} \cdot \frac{Q_1^2}{Q^2} u_a^2. \tag{12}$$

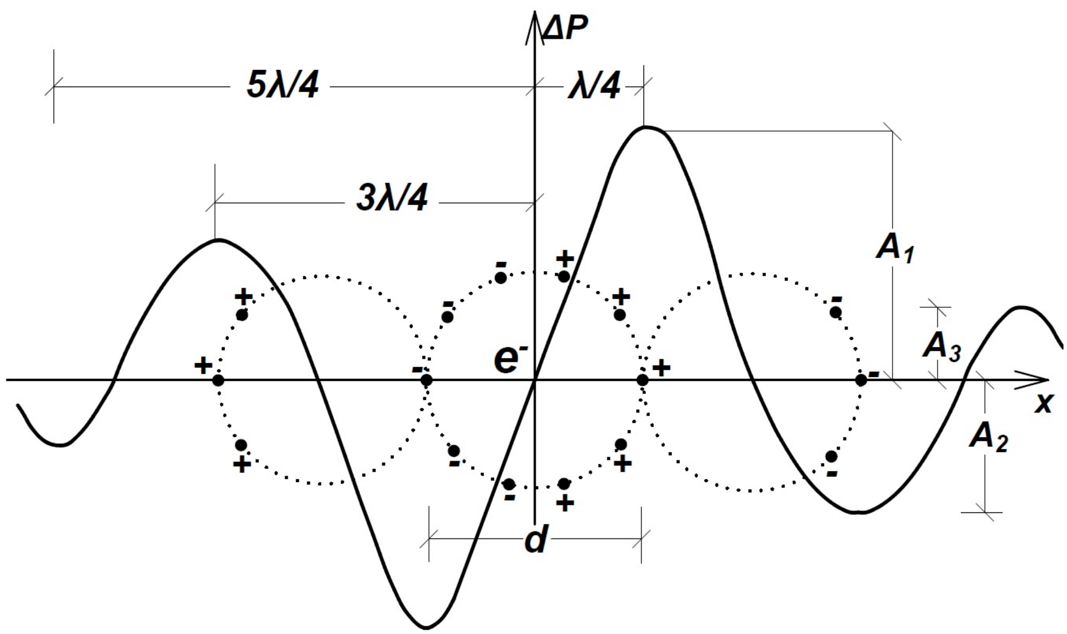

Figure 2. Descending change of pressure difference ΔP as motion arrow[6] of the electron with a motion formation diameter $d = \lambda/2$, where λ the wavelength of the decreasing fluctuation amplitude A of motion wave ($A_1 = P_0 u_a^2/2$, $A_2 = P_0 u_a^4/2$, $A_3 = P_0 u_a^6/2$, where $u_a < 1$ the timeless speed[6] of the electron)

However, due to Eq. 9, Eq. 12 becomes

$$A_2 = A_1 u_a^2, \tag{13}$$

which results in

$$A_2 = A_1 u_a^2, A_3 = A_2 u_a^2, A_4 = A_3 u_a^2, ..., A_n = A_{n-1} u_a^2, \tag{14}$$

where A_n is the amplitude on either side of the formation and, due to Eq. 8, the Eq. 14 becomes

$$A_1 = \frac{P_0}{2} u_a^{2\cdot 1}, A_2 = \frac{P_0}{2} u_a^{2\cdot 2}, A_3 = \frac{P_0}{2} u_a^{2\cdot 3}, ..., A_n = \frac{P_0}{2} u_a^{2n}. \tag{15}$$

Therefore, we conclude that the fluctuation amplitude decreases with geometrical progress and more pronounced for low speeds, since the timeless speed is $u_a < 1$.

The wavelength of the formation (Fig. 2) is $\lambda = 2d$ and, of course, the first fluctuation amplitude of ΔP is $A_1 = P_0 u_a^2/2$ (Eq. 8) observed at the ends of the half-wave $\lambda/2$. This fluctuation decreases by geometrical progress, as mentioned above.

The fluctuation amplitude of wavelength $\lambda = \lambda/2 + \lambda/2$ corresponding to the diameter $d = \lambda/2$ of the grouping unit (Fig. 2), and for

$$x = \frac{\lambda}{4}, \frac{3\lambda}{4}, \frac{5\lambda}{4}, ..., \frac{(2n-1)\lambda}{4}. \tag{16}$$

namely for $x = (2n-1)\lambda/4$ (Eq. 16) and for the absolute value of x, it is

$$n = \frac{2|x| + \lambda/2}{\lambda}. \tag{17}$$

Therefore, due to Eqs 8 and 17, the general equation (Eq. 15) of the amplitude becomes

$$A = A_n = \frac{P_0}{2} u_a^{2n} = A_1 u_a^{2n-2} = A_1 u_a^{\frac{4|x|+\lambda}{\lambda} - 2} \Rightarrow A = A_1 u_a^{\frac{4|x|+\lambda}{\lambda} - 2}, \tag{18}$$

which for $|x| > \lambda/4$ decreases continuously.

3. Interpretation of Heisenberg's uncertainty principle

The unified theory of dynamic space interprets the uncertainty in the measurement of a particle's position and momentum, for which Heisenberg's mathematical expression exists

$$\Delta p \Delta x \geq \hbar \Rightarrow \Delta p \Delta x \geq \frac{h}{2\pi}, \tag{19}$$

as the cause of the particle-electron movement and specifically in the fluctuation of the amplitude A (Eq. 18) of the pressure difference ΔP, which is A_1 maximum at the limits $+\lambda/4$ and $-\lambda/4$ on either side of the electron (Fig. 2). The rapid decrease of the above amplitude, as a function of the distance x from the electron, is the cause of the uncertainty in the measurement. Therefore, we have to express the Heisenberg's uncertainty principle (Eq. 19) with ΔA and Δx, i.e. replacing the momentum difference Δp with the amplitude difference ΔA.

The accumulated force[8] F_s of the electron as a function of its timeless speed u_a, where F_0 the gravity force[9] of the electron, has been calculated as

$$u_a = \frac{F_s}{\sqrt{F_0^2 + F_s^2}} \Rightarrow F_s = \frac{F_0}{\sqrt{\frac{1}{u_a^2} - 1}} \tag{20}$$

and substituting $u_a^2 = 2A_1/P_0$ (Eq. 8) in Eq. 20, we have the maximum and the general accumulated forces of the electron formation

$$F_{s1} = \frac{F_0}{\sqrt{\frac{P_0}{2A_1} - 1}} \Rightarrow F_s = \frac{F_0}{\sqrt{\frac{P_0}{2A} - 1}}. \tag{21}$$

However, the amplitude A as a function of x is $A = A_1 u_a^{\frac{4|x|+\lambda}{\lambda} - 2}$ (Eq. 18) and for

$$x = k\lambda, \tag{22}$$

it is $A = A_1 u_a^{4k-1}$ and by replacing in Eq. 21 the accumulated force F_s of the electron, at a distance $x = k\lambda$, is

$$F_s = \frac{F_0}{\sqrt{\frac{P_0}{2A_1 u_a^{4k-1}} - 1}}. \tag{23}$$

Dividing by terms equations Eqs 23 and 21, we have

$$\frac{F_s}{F_{s1}} = \frac{\sqrt{\frac{P_0}{2A_1} - 1}}{\sqrt{\frac{P_0}{2A_1 u_a^{4k-1}} - 1}} \Rightarrow F_s = F_{s1}\frac{\sqrt{1 - \frac{2A_1}{P_0}}}{\sqrt{1 - \frac{2A_1}{P_0} u_a^{4k-1}}} u_a^{2k-1/2}. \tag{24}$$

Substituting equation $u_a^2 = 2A_1/P_0$ (Eq. 8) into Eq. 24, it is

$$F_s = F_{s1}\frac{\sqrt{1 - u_a^2}}{\sqrt{1 - u_a^{4k+1}}} u_a^{2k-1/2}. \tag{25}$$

and due to $u_a^{4k+1} \ll 1$, it is omitted in the denominator, so it holds

$$F_s \geq F_{s1}\sqrt{1 - u_a^2} \cdot u_a^{2k-1/2}. \tag{26}$$

Also, it is approximate

$$\sqrt{1 - u_a^2} = 1 - \frac{u_a^2}{2} \tag{27}$$

and therefore, the accumulated force F_s (Eq. 26), at a distance $x = k\lambda$ (Eq. 22) from the electron, will be then

$$F_s \geq F_{s1}(1 - \frac{u_a^2}{2}) u_a^{2k-1/2}. \tag{28}$$

The maximum accumulated force F_{s1} and the accumulated ones F_s at a distance $x = k\lambda$ (Eq. 22) from the electron, as a function of its impulse-momentum[10]

$$p = F\frac{L_0}{C_0}, \tag{29}$$

are

$$F_s = p_s \frac{C_0}{L_0} \Rightarrow F_{s_1} = p_{s_1}\frac{C_0}{L_0} \tag{30}$$

where L_0 the dipole length[3] and substituting in Eq. 28, we have

$$p_s \geq p_{s1}(1 - \frac{u_a^2}{2}) u_a^{2k-1/2}. \tag{31}$$

Considering the uncertainty of the position $\Delta x = k\lambda$ (Eq. 22) and multiplying the equations Eqs 31 and 22 by terms, we have

$$p_s \Delta x \geq p_{s1} k\lambda (1 - \frac{u_a^2}{2}) u_a^{2k-1/2}, \tag{32}$$

where

$$p_{s1}\lambda = h \tag{33}$$

the Planck's constant[11] and so

$$p_s \Delta x \geq hk(1 - \frac{u_a^2}{2}) u_a^{2k-1/2} \tag{34}$$

and due to $u_a^2 \ll 1$, it is

$$p_s \Delta x \geq h k u_a^{2k-1/2}. \tag{35}$$

However,

$$k u_a^{2k-1/2} < 1, \tag{36}$$

namely it is

$$k u_a^{2k-1/2} \sim \frac{1}{2\pi}, \tag{37}$$

as correspondingly applies to the Heisenberg's uncertainty principle (Eqs 35 and 19).

Therefore, the rapid decrease of the amplitude A, as a function of the distance x from the electron (Fig. 2), is the cause $A(p_s)$ and Δx (Eq. 35) to be inversely proportional, i.e. the cause of the uncertainty in the measurement.

4. References

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