THE UNCERTAINTY PRINCIPLE IS UNTENABLE

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By re-analysing Heisenberg's Gamma-Ray Microscope experiment and the ideal experiment from which the uncertainty principle is derived, it is actually found that the uncertainty principle can not be obtained from them. It is therefore found to be untenable.

Key words:
uncertainty principle; **Heisenberg's Gamma-Ray Microscope Experiment**; ideal experiment

Ideal Experiment 1

Heisenberg's Gamma-Ray Microscope Experiment

A free electron sits directly beneath the center of the microscope's lens (please see AIP page http://www.aip.org/history/heisenberg/p08b.htm or diagram below) . The circular lens forms a cone of angle **2A** from the electron. The electron is then illuminated from the left by gamma rays--high energy light which has the shortest wavelength. These yield the highest resolution, for according to a principle of wave optics, the microscope can resolve (that is, "see" or distinguish) objects to a size of **dx**, which is related to and to the wavelength **L** of the gamma ray, by the expression:

dx = L/(2sinA) **(1)**

However, in quantum mechanics, where a light wave can act like a particle, a gamma ray striking an electron gives it a kick. At the moment the light is diffracted by the electron into the microscope lens, the electron is thrust to the right. To be observed by the microscope, the gamma ray must be scattered into any angle within the cone of angle **2A**. In quantum mechanics, the gamma ray carries momentum as if it were a particle. The total momentum p is related to the wavelength by the formula,

p = h / L, where h is Planck's constant. **(2)**

In the extreme case of diffraction of the gamma ray to the right edge of the lens, the total momentum would be the sum of the electron's momentum **P'x** in the **x** direction and the gamma ray's momentum in the **x** direction:

P' x + (h sinA) / L', where L' is the wavelength of the deflected gamma ray.

In the other extreme, the observed gamma ray recoils backward, just hitting the left edge of the lens. In this case, the total momentum in the **x** direction is:

P''x - (h sinA) / L''.

The final **x** momentum in each case must equal the initial **x** momentum, since momentum is conserved. Therefore, the final **x** momenta are equal to each other:

P'x + (h sinA) / L' = P''x - (h sinA) / L'' **(3)**

If **A** is small, then the wavelengths are approximately the same,

L' ~ L'' ~ L. So we have

P''x - P'x = dPx ~ 2h sinA / L **(4)**

Since **dx = L/(2 sinA)**, we obtain a reciprocal relationship between the minimum uncertainty in the measured position, **dx**, of the electron along the **x** axis and the uncertainty in its momentum, **dPx**, in the **x** direction:

dPx ~ h / dx or dPx dx ~ h. **(5)**

For more than minimum uncertainty, the "greater than" sign may added.

Except for the factor of **4pi** and an equal sign, this is Heisenberg's uncertainty relation for the simultaneous measurement of the position and momentum of an object.

Re-analysis

To be seen by the microscope, the gamma ray must be scattered into any angle within the cone of angle **2A**.

The microscope can resolve (that is, "see" or distinguish) objects to a size of **dx**, which is related to and to the wavelength **L** of the gamma ray, by the expression:

dx = L/(2sinA) **(1)**

This is the resolving limit of the microscope and it is the uncertain quantity of the object's position.

The microscope can not see the object whose size is smaller than its resolving limit, **dx**. Therefore, to be seen by the microscope, the size of the electron must be larger than or equal to the resolving limit.

But if the size of the electron is larger than or equal to the resolving limit **dx**, the electron will not be in the range **dx**. Therefore, **dx** can not be deemed to be the uncertain quantity of the electron's position which can be seen by the microscope, but deemed to be the uncertain quantity of the electron's position which can **not** be seen by the microscope. To repeat, **dx** is uncertainty in the electron's position which can **not** be seen by the microscope.

To be seen by the microscope, the gamma ray must be scattered into any angle within the cone of angle **2A**, so we can measure the momentum of the electron.

dPx is the uncertainty in the electron's momentum which can be seen by microscope.

What relates to **dx** is the electron where the size is smaller than the resolving limit. When the electron is in the range **dx**, it can not be seen by the microscope, so its position is uncertain.

What relates to **dPx** is the electron where the size is larger than or equal to the resolving limit .The electron is not in the range **dx**, so it can be seen by the microscope and its position is certain.

Therefore, the electron which relates to **dx** and **dPx** respectively is not the same. What we can see is the electron where the size is larger than or equal to the resolving limit **dx** and has a certain position, **dx = 0**.

Quantum mechanics does not rely on the size of the object, but on Heisenberg's Gamma-Ray Microscope experiment. The use of the microscope must relate to the size of the object. The size of the object which can be seen by the microscope must be larger than or equal to the resolving limit **dx** of the microscope, thus the uncertain quantity of the electron's position does not exist. The gamma ray which is diffracted by the electron can be scattered into any angle within the cone of angle **2A**, where we can measure the momentum of the electron.

What we can see is the electron which has a certain position, **dx = 0**, so that in no other position can we measure the momentum of the electron. In Quantum mechanics, the momentum of the electron can be measured accurately when we measure the momentum of the electron only, therefore, we have gained $dPx = 0$.

And,

$dPx\ dx = 0$. **(6)**

Ideal experiment 2

Single Slit Diffraction Experiment

Suppose a particle moves in the **Y** direction originally and then passes a slit with width **dx**(Please see diagram below) . The uncertain quantity of the particle's position in the **X** direction is **dx**, and interference occurs at the back slit . According to Wave Optics , the angle where No.1 min of interference pattern is can be calculated by following formula:

$\sin A = L/2dx$ **(1)**

and $L = h/p$ where h is Planck's constant. **(2)**

So the uncertainty principle can be obtained

$dPx\ dx \sim h$ **(5)**

Re-analysis

According to Newton first law , if an external force in the **X** direction does not affect the particle, it will move in a uniform straight line, (Motion State or Static State) , and the motion in the **Y** direction is unchanged .Therefore , we can learn its position in the slit from its starting point.

The particle can have a certain position in the slit and the uncertain quantity of the position is **dx =0**. According to Newton first law , if the external force at the X direction does not affect particle, and the original motion in the Y direction is not changed , the momentum of the particle int the X direction will be **Px=0** and the uncertain quantity of the momentum will be **dPx =0**.

This gives:

dPx dx =0. **(6)**

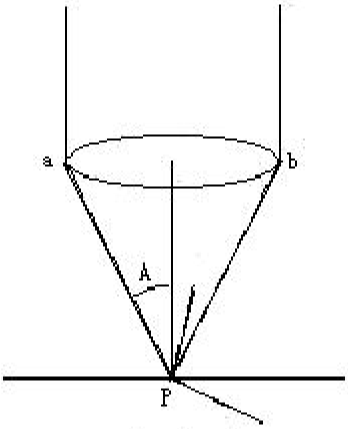
No experiment negates NEWTON FIRST LAW. Whether in quantum mechanics or classical mechanics, it applies to the microcosmic world and is of the form of the Energy-Momentum conservation laws. If an external force does not affect the particle and it does not remain static or in uniform motion, it has disobeyed the Energy-Momentum conservation laws. Under the above ideal experiment , it is considered that the width of the slit is the uncertain quantity of the particle's position. But there is certainly no reason for us to consider that the particle in the above experiment has an uncertain position, and no reason for us to consider that the slit's width is the uncertain quantity of the particle. Therefore, the uncertainty principle,

dPx dx ~ h **(5)**

which is derived from the above experiment is unreasonable.

Concluson

From the above re-analysis , it is realized that the ideal experiment demonstration for the uncertainty principle is untenable. Therefore, the uncertainty principle is untenable.

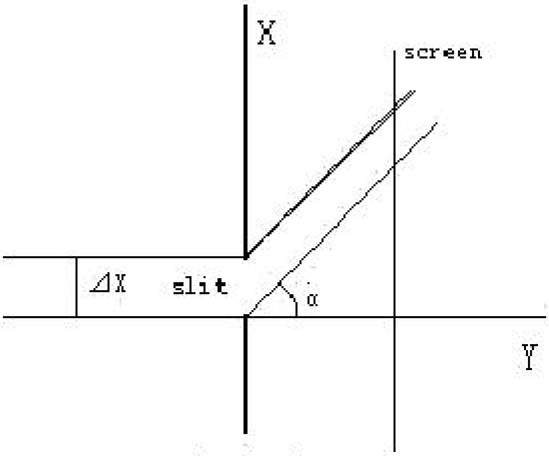


Drawing 1

Experiment of Heisenberg Gamma-Ray Microscope

Pa and Pb are the extreme forward scattering and extreme backward scattering

2A is the field angle formed between the diameter of the land the object



Drawing 2

Experiment of single slit diffraction

⊿X is the width of the slit

α is the angle where NO.1 min of interference pattern is

Reference:

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