

UNCERTAINTY PRINCIPLE  
IS  
UNTENABLE

By reanalysing the experiment on Heisenberg Gamma-Ray Microscope and one of ideal experiment from which uncertainty principle is derived , it is found that actually uncertainty principle can not be obtained from these two ideal experiments . And it is found that uncertainty principle is untenable.

Key words :

uncertainty principle; experiment on Heisenberg Gamma-Ray Microscope; ideal experiment

Ideal Experiment 1 [1]

Experiment on Heisenberg Gamma-Ray Microscope

A free electron sits directly beneath the center of the microscope's lens (see the picture above). The circular lens forms a cone of angle  $2\omega$  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  $\Delta x$ , which is related to and to the wavelength  $L$  of the gamma ray, by the expression:

$$\Delta x = L/(2\sin \omega) \quad (1)$$

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  $2\omega$ . 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

$$p = h / L, \text{ where } h \text{ is Planck's constant.} \quad (2)$$

In the extreme case of diffraction of the gamma ray to the right edge of the lens, the total momentum in the  $x$  direction 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:

$P'_x + (h \sin \omega) / L'$ , 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:

$$P''_x - (h \sin \omega) / L''.$$

The final x momentum in each case must equal the initial x momentum, since momentum is never lost (it is conserved). Therefore, the final x momenta are equal to each other:

$$P'_x + (h \sin \omega) / L' = P''_x - (h \sin \omega) / L'' \quad (3)$$

If  $\omega$  is small, then the wavelengths are approximately the same,  $L' \sim L'' \sim L$ . So we have

$$P''_x - P'_x = \Delta P_x \sim 2h \sin \omega / L \quad (4)$$

Since  $\Delta x = L/(2 \sin \omega)$ , we obtain a reciprocal relationship between the minimum uncertainty in the measured position,  $\Delta x$ , of the electron along the x axis and the uncertainty in its momentum,  $\Delta P_x$ , in the x direction:

$$\Delta P_x \sim h / \Delta x \quad \text{or} \quad \Delta P_x \Delta x \sim h. \quad (5)$$

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

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

## Reanalysis

For the electron visible with microscope , photon quantum should be scattered to inside  $2\omega$  angle .

Uncertainty of position measuring

$$\Delta x = L/(2\sin \omega) \quad (1)$$

$\Delta x$  is a very small distance between the points on the object plane which can just only be seen by microscope . It is the resolving limit of microscope .

Microscope can not see the object whose size is shorter than the resolving limit .

Therefore, for the electron visible with microscope, size of the electron must be longer than the resolving limit .

But if the size of the electron is longer than  $\Delta x$ (the resolving limit) , electron will not be in  $\Delta x$  range .  $\Delta x$  can not be deemed to be the uncertainty of position measuring of the electron which can be seen by microscope yet.  $\Delta x$  can be deemed to be the uncertainty of position measuring of the electron which can not be seen by microscope only.

What relates to  $\Delta x$  is the electron of which the size is shorter than the resolving limit .Electron is in  $\Delta x$  range that it can not be seen.

What relates to  $\Delta Px$  is the electron of which the size is longer

than the resolving limit .Electron is not in  $\Delta x$  range that it can be seen.

Therefore , the electron which relate to  $\Delta x$  and  $\Delta Px$  respectively is not the same .

What we can see is the electron which have determinate position .

Although quantum mechanics does not relate to the size of object. But on the Experiment On Heisenberg Gamma-Ray Microscope, the using of microscope must relate to the size of object, the size of the object which can be seen by microscope must be longer than the resolving limit( $\Delta x$ ) of microscope, thus it does not exist alleged uncertainty of position measuring of the electron( $\Delta x$ ).

Thereout gained , what we can see is the electron which has determinate position .

$\Delta x = 0$  root in no other than two observed result of microscope :visible OR invisible.There does not exist the third result which visible AND invisible. . visible namely  $\Delta x = 0$ , invisible namely  $\Delta x > 0$  .

Because, for the electron visible with microscope, size of the electron must be longer than the resolving limit. what we can see is the electron which has determinate position,

$\Delta x = 0$ , so that none but the uncertainty of position measuring of particle to be zero, namely  $\Delta x = 0$ , can just measure the momentum of particle. On the Experiment On Heisenberg Gamma-Ray Microscope, now that  $\Delta x = 0$ , that simply measure the momentum of particle, moreover the momentum of particle can be measured accurately when separately measured, therefore we can gain  $\Delta P_x = 0$ .

Therefore ,

$$\Delta P_x \Delta x = 0. \quad (6)$$

## Ideal experiment 2 [2]

### Experiment on single slit diffraction

Supposing one "particle" moves in Y direction originally and then passes a slit with  $\Delta x$  width . So the indefinite quantity of the particle position in X direction is  $\Delta x$  (drawing 2) , 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 :

$$\sin \alpha = L/2 \Delta x \quad (1)$$

and

$$L=h/p \quad \text{where } h \text{ is Planck's constant.} \quad (2)$$

So uncertainty principle obtained

$$\Delta P_x \Delta x \sim h \quad (5)$$

### Reanalysis

According to Newton first law , if the external force at the X direction does not affect “particle” ,the “particle” will keep the uniform straight line Motion State or Static State , and the motion at the Y direction unchangeable .Therefore , we can lead its position in the crevice form its starting point .

The particle can have the confirmed position in the crevice , and the uncertainty of the position  $\Delta x =0$  .

According to Newton first law , if the external force at the X direction does not affect “particle”,and the original motion at the Y direction is unchangeable , the momentum of the “particle” at the X direction will be  $P_x=0$  , and the uncertainty of the momentum will be  $\Delta P_x =0$ .

Get:

$$\Delta P_x \Delta x =0. \quad (6)$$

It has not any experiment to negate NEWTON FIRST LAW, in spite of quantum mechanics or classical mechanics, NEWTON FIRST LAW can be the same with the microcosmic world.

Under the above ideal experiment , it considered that slit width is exactly position uncertainty . But there is no reason for us to consider that the “particle” in experiment certainly have position uncertainty , and no reason for us to consider that the slit width is exactly position uncertainty .Therefore,

uncertainty principle

$$\Delta P_x \Delta x \sim h \quad (5)$$

which is derived from the above experiment is unreasonable .

### Conclusion

From the above reanalysis , it is realized that the ideal experiment demonstration for uncertainty principle is untenable .  
uncertainty principle is untenable. .

Reference book :

[ 1 ] Max Jammer. (1974) The philosophy of quantum mechanics (John wiley & sons , Inc New York ) Page 65

[ 2 ] Max Jammer. (1974) The philosophy of quantum mechanics (John wiley & sons , Inc New York ) Page 67

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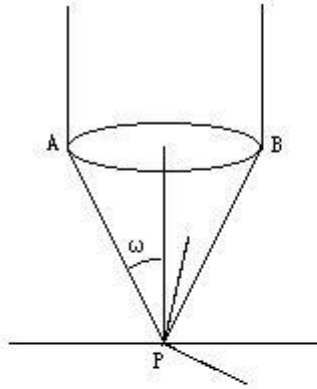
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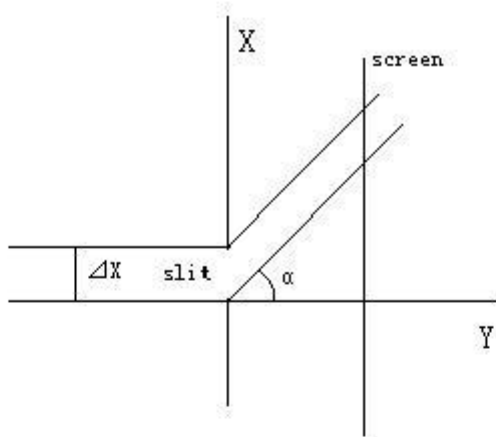
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Drawing 1  
 Experiment on Heisenberg  $\gamma$  Ray Microscope  
 PA and PB are the extreme forward scattering and the  
 extreme backward scattering  
 $2\omega$  is the field angle formed between the diameter of  
 the lens and the object



Drawing 2  
 Experiment on single slit diffraction  
 $\Delta x$  is the width of the slit  
 $\alpha$  is the angle where No.1 min of interference pattern is

