The double slit and camera obscura experiments

Ferman experiment -- published -- 2011-12-12

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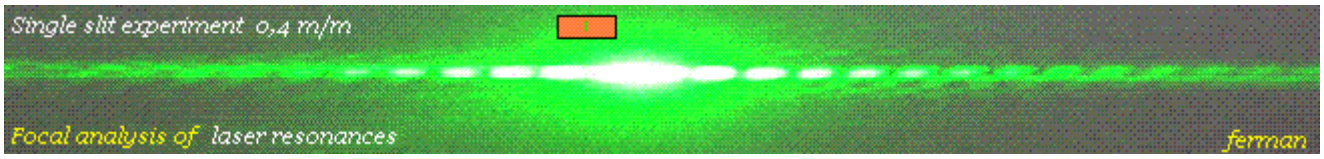
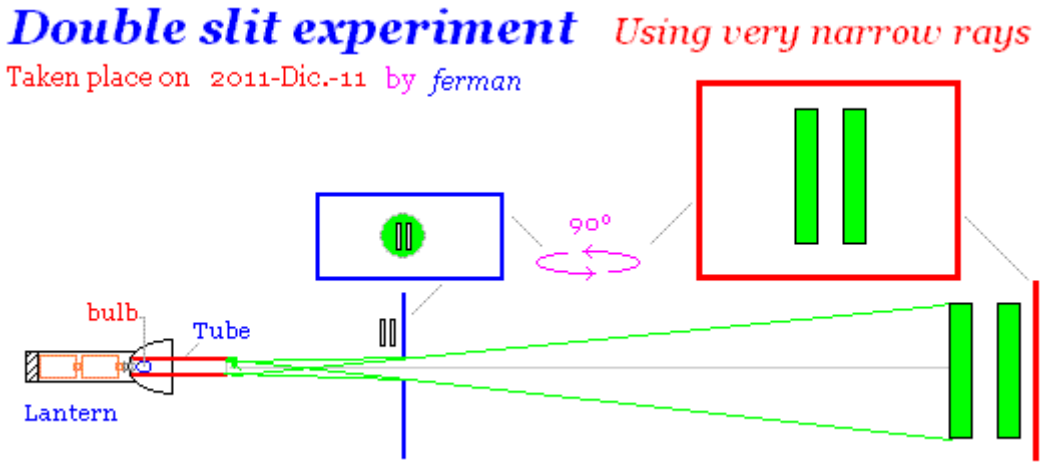


Corpuscular nature of light
Certainty and location properties of particles
Experiment y conclusion with laser rays



The double-slit experiment has been used extensively to the study and demonstration of some phenomena such as the light nature (corpuscular and/or wave), quantum mechanics principles, and others (**).
And this way, to these experiments we have become them the true test to explain the main phenomena in the behavior of particles.
In the same way, I make use of them in my particular vision, explanation and demonstration (I think) of the nature and characteristics in the phenomena of particles emissions, mainly the light particles or photons.

As we know the double-slit experiment consists of a source or ray of light (photons), directed toward a screen where they impact producing their mark.
Between the emitter of light and the screen, we intercalate o situate another smaller screen with one or two slits that only lets to pass the photons through these slits.
The experiment is therefore to see what marks left on the final screen the light that passes through the slits only, and later on, studying the marks we can deduce the properties and characteristics of the emission of particles.

(**) Contrarily to what is postulated now, the simple and double slit experiments (with several particles) show us in a clear and radical way the corpuscular (but not wavy) nature of particles, particularly light, as is explained to the end of this work.
As well with this experiment and the results you can discus and rebut the various possibilities and nature of light, and in general of the particles emissions.
With these results many scientists bet for the dual nature of light, corpuscular and wave at the same time.
Also with them many quantum scientists justify the validity of quantum mechanics and its tenets such as the delocalization of particles, uncertainty, and others.
When being me a classical physicist, I also will try to demonstrate with these experiments of single and double slit (also with the camera obscure experiment) the following principles or postulates:

--- Light has corpuscular nature, although as any particle (or simple material) it may cause waves for where circulate and when there is an appropriate medium to make it.
--- The results of the simple and double slit experiment can be perfectly explained in a not quantum way, a way where the light or photons have the behavior and characteristics of corpuscular particles.
--- Delocalization of particles that promotes quantum mechanics is not possible, and it is shown by the results of the experiment of single slit, the camera obscure experiment and a whole series of observable and constant phenomena around us.
This way, I am going to start with the exposure of the following themes and experiments:

Double slit experiment

Taken place on 2011-12-11

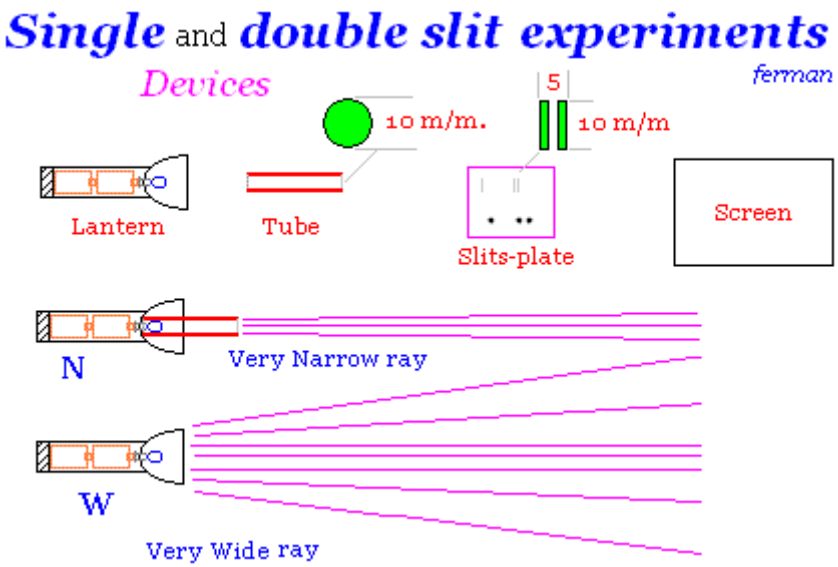
These experiments have been carried out with simple home-made devices, as we'll see next, but to the understanding of its author the results show us clearly the characteristics and peculiarities in the emission light.
To explain the experiments we will first have to expose certain physical principles required to better understand the explanations of the results.

A1.- The first consideration is that these experiments are similar to the well-known Camera Obscura applications and we must know their principles in order to better understanding of the results of these experiments in slits and holes.
As we know, in the Camera Obscura a hole or lens at the entrance of the same one makes us see in the inner screen the inverted image of the objects that are situated outside the camera.

A2.- We must also look at the qualities of light, shadows and penumbras produced behind objects when the beams of light encounter them.
For example, if we look at a broad focus such as the Sun, it produces behind objects shadows and penumbras, as light rays are fully covered by the object (shadow) or only part of these rays (penumbra).

So when wider focus less shadow and more penumbras, and vice versa.
Thus if the focus is a simple point of light, we only obtain shadow, but no penumbra.
And this characteristic is very important for our experiments, as we shall see later.
As I said above, move on to expose the elements or devices that I have used in the experiment.

Devices



To run the experiment we have:

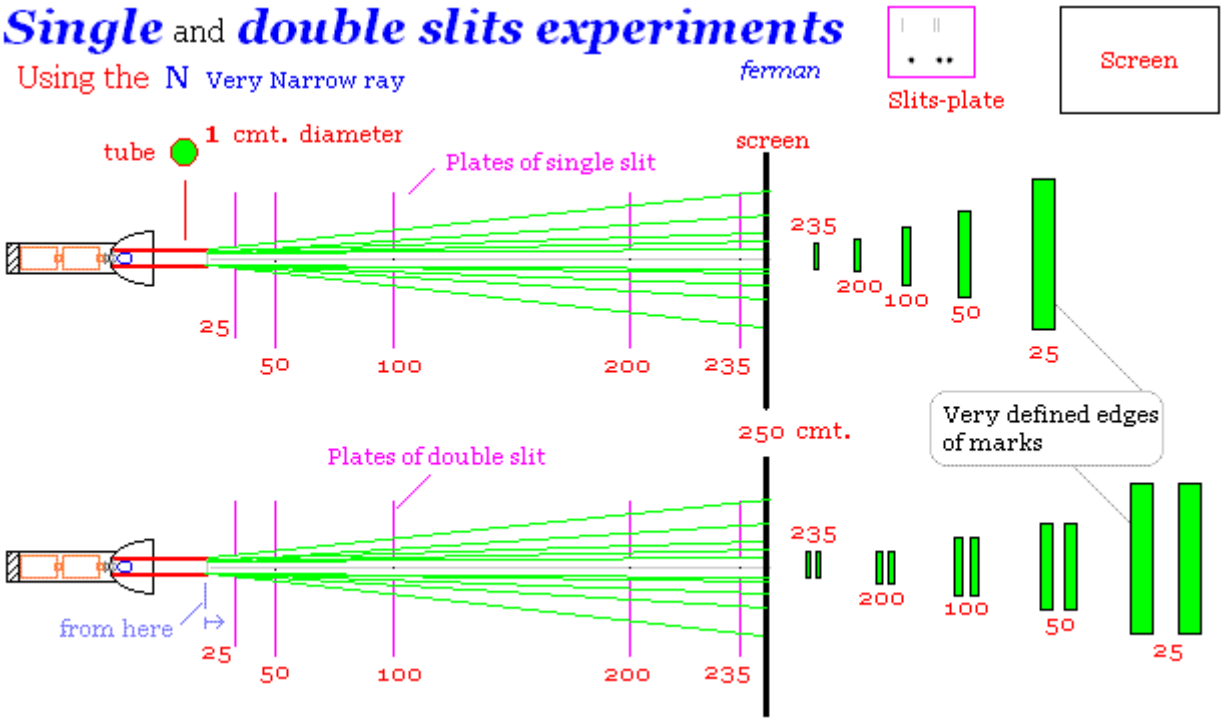
-A lantern for the light ray.
-A small tube (rolled paper card) suitable for the lantern bulb in order to produce a very narrow ray. *
-A plate in which we will make the appropriate slits and holes for the experiments.
-A screen to see the marks produced by the light ray.

* It has to be a hermetical tube in order of not allow the scape of any lateral ray of light that could give dirty marks.

The adaptable small tube will alternatively used to see how marks are produced when the light ray is wide or when the ray is narrow.
As the most interesting experiment for us will possibly be when is used the narrow light ray, we adapt the slits and holes to the diameter of the tube focus, i.e., slits with a length of 10 m/m which is the diameter of the tube focus.

Single and double slit experiment with narrow luminous ray.

The experiments with narrow luminous ray are for me the most important because they give us the true nature of light when doesn't have penumbras nor mixture of images or marks.

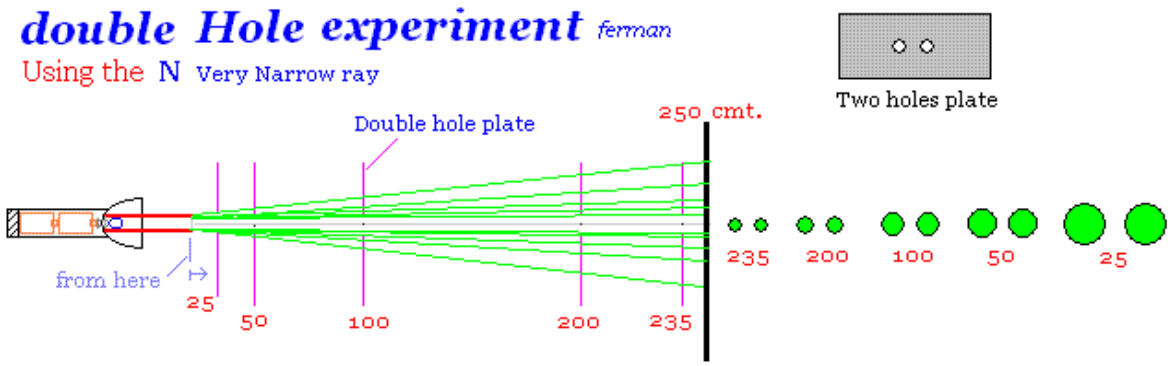


As we see in the picture when we use narrow luminous ray, the marks on the screen show purity and definition, without distortion of the forms of the slits or holes that let to pass the ray.
And this is because there is only a very narrow focus and angle of emission.
When the focus is broad, it is also produced an (inverse) angle between the slits and circumference of the focus, which is imperceptible in the narrow light rays.
So here are clarity and purity of the figure of the slit or hole and also its situation between them, just as we see in the picture.
Alone variations of the magnitude of the signal exist, which will be greater when smaller is the distance between focus and the plate of slits, and vice versa.
When the slits-plate is on the screen, the dimensions of the marks are the same than the slits.

Conclusions:

1.- When having the marks on the screen full definition and clear edges, as well as of keeping the angle of incidence from the focus to the screen in a total straight line, it tells us that photons are particles and not waves, because is photons were waves they would expand and propagate without conserving the exit angles neither defined figures and with enormous dimensions, brightly in the center and more tenuous toward the sides.
2.- In addition, as we can see that the double slit have the same format as the simple slit and there are only two bands, no more, because we can see that there is not any type of interference of waves in the experiment.

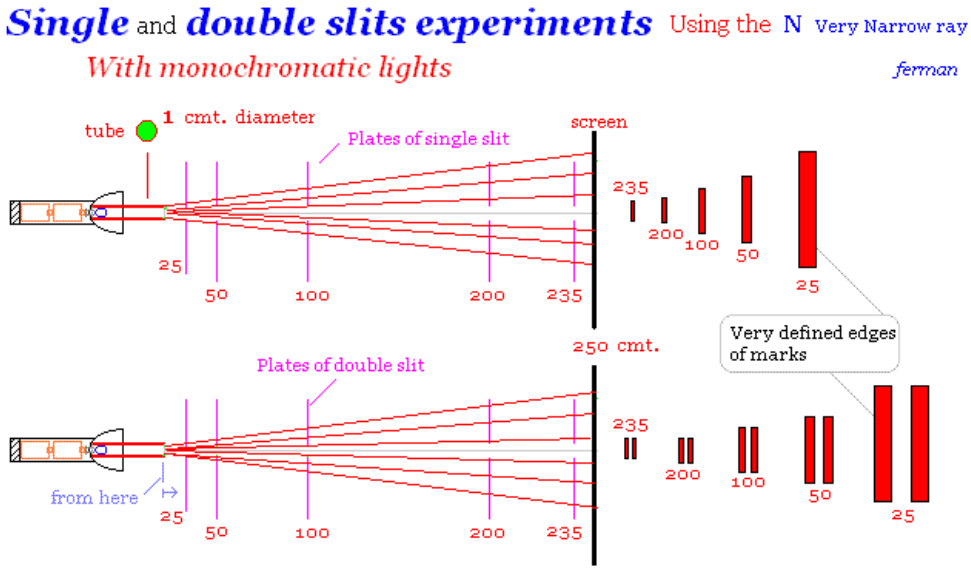
Double hole experiment with narrow luminous ray.



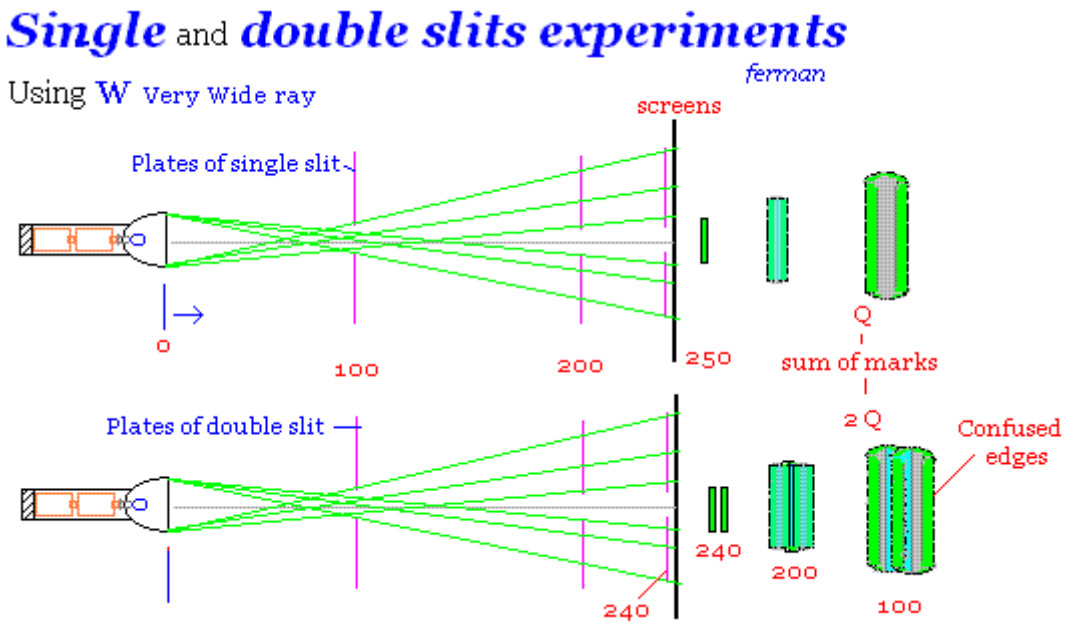
This experiment is similar to the double-slit, although I put it because the observation of the drawing could go to helping us for a better understanding of these effects of light rays in the case of narrow light rays.
We also note here the sharpness of its forms, and that the only variable is the result of the placement distance between the holes and the bright focus.
Also here the particle nature of light seems to be demonstrated.

Experiments with monochromatic light

The experiments made up with white light and narrow luminous ray I have also made them with monochromatic light of several colors and slits apertures, giving me the same results, but not finding any manifestations of wave interferences.
Therefore, and as we will see later, the multiple marks that show us the laser rays are simply marks of the resonances that compose these laser.



Single and double experiment with wide luminous ray



Using a broad light ray the results are very different.
But why?
Because here the existence of double angle of incidence (emission and reverse) give us not only marks of light, but also marks of penumbra.
Just as in the camera obscura, bright sources of large area we must consider them as the union of multiple narrow focus.
Already here we will not have a sharp and well lined signal, but a signal with a centre of high brightness and a periphery of penumbra.
To observe and understand adequately this single slit experiment, we should make the following proof:

Firstly we put the slit plate closed to the screen of impact, and we can observe as the mark in the screen are similar to the slit.
Then we go separating slowly the slit-plate from the screen.
And we can observe that the mark goes acquiring some shadows and acquiring more volume. Of course, these circumstances are due to the great angle that the focus has.
So with this wide luminous focus we can obtain great increment of the marks in the screen and some vertical lines of shadows as for the focus qualities.
Any imperfection in the focus is vertically showed in the screen.

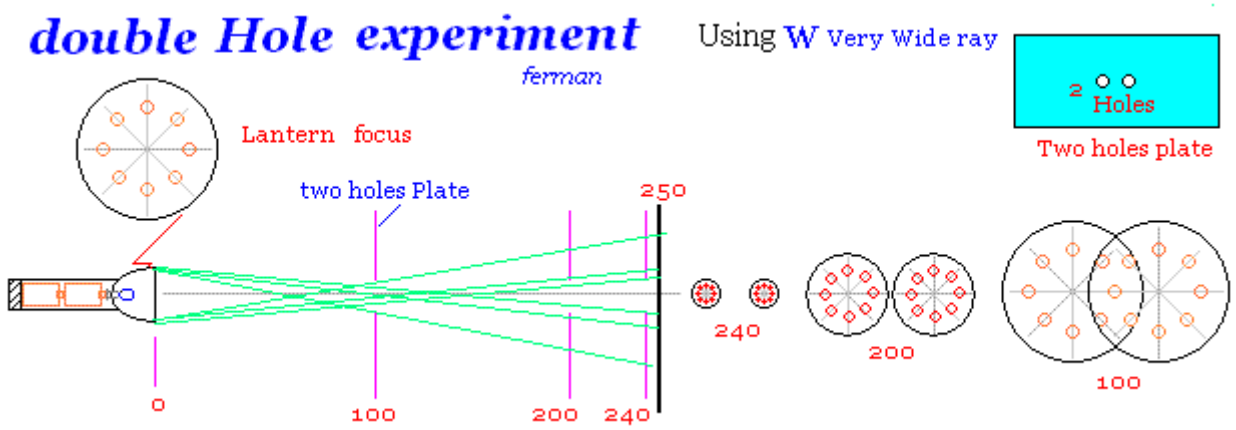
Now well, for the double slit experiment we can make the same proof:

Firstly we put de double slit plate closed to the screen of impact, observing that the marks are similar in dimensions and clarity to the double slit.
But this case, when we go separating the slits plate from the screen, we can see as the marks go increasing quickly due to the wide amplitude of the luminous focus.
But each slit mark conserves the same shape y properties than in the experiment with alone one slit. We never observe news forms or marks. Although when we go separating a lot the slits plate, the mark start to unite between them, and later on, to go superimposing between them and giving us the sum of their lights and shadows.
But never we can observe news marks, alone sum of the particular marks of each one.

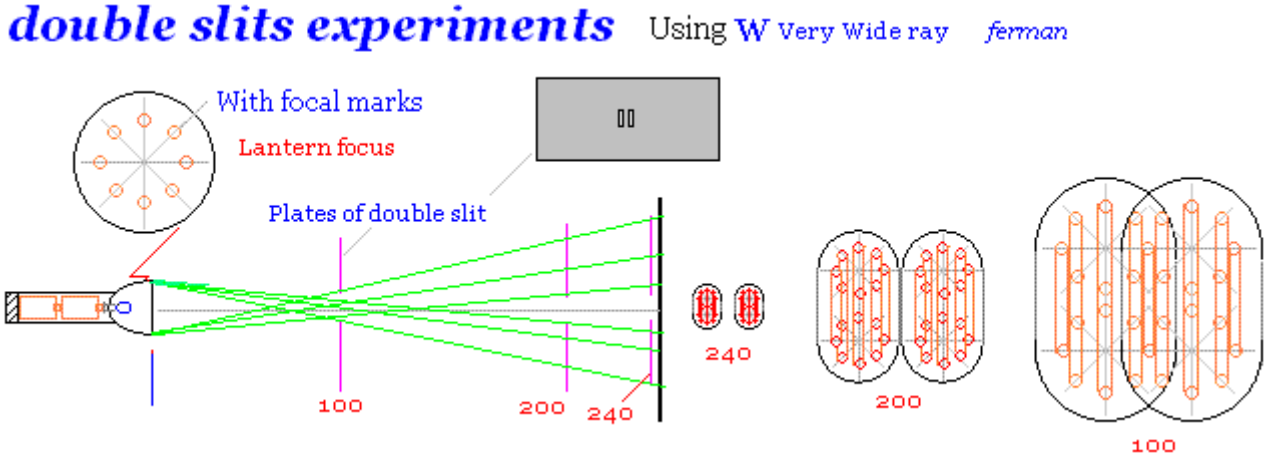
At this point I have to give my opinion on these experiments:

"Due to the diffuse, complex, mixed signal and lack of uniformity of the luminous rays of wide extension they are inadequate to study the peculiarities of the emission of light and particles."

Double hole experiment with wide luminous ray.



This experiment is similar to above but using holes instead of slits.
In this, I've also put more details using drawings or marks that contains the reflective parable of the lantern to see how running these drawings on the screen of impact and thereby achieve a better explanation of the marks left on the screen.
As shown, in the drawings with two holes we can see images of the bright focus including the marks that the reflective parable has.
When the holes plate was very close to the screen of impact, the marks in the screen are of equal magnitude to the holes, including inside these marks the drawing that the parable contains.
If now we gradually separate the plate holes, we see how the marks go growing including the drawing of the parable that luminous ray transports.
Finally, the marks grow enough to be superimposed between them, summing their peculiarities. But never we can observe news marks similar to waves interferences.

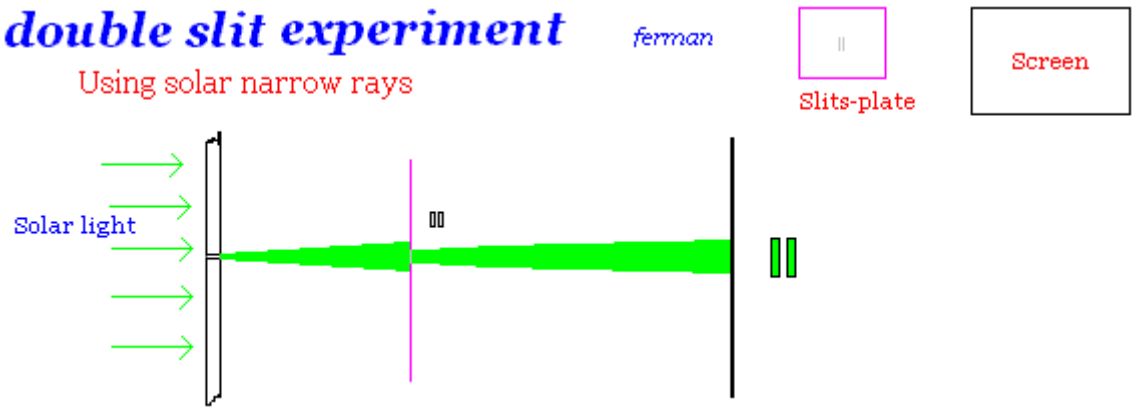


In the previous drawing we can see as any band, shape, intensity, reflection, etc., in the bright focus is deformed in longitudinal way when passing through a slit, precisely to be longitudinal the slit.

In opinion of this author, and in the case of laser, the interior resonance of the same ones could produce resultant rays composed of several resonances with different emission angles which can produce different impact marks on the screen.

So the laser rays would not be clean enough for being used in the study of the characteristics of the light emissions.

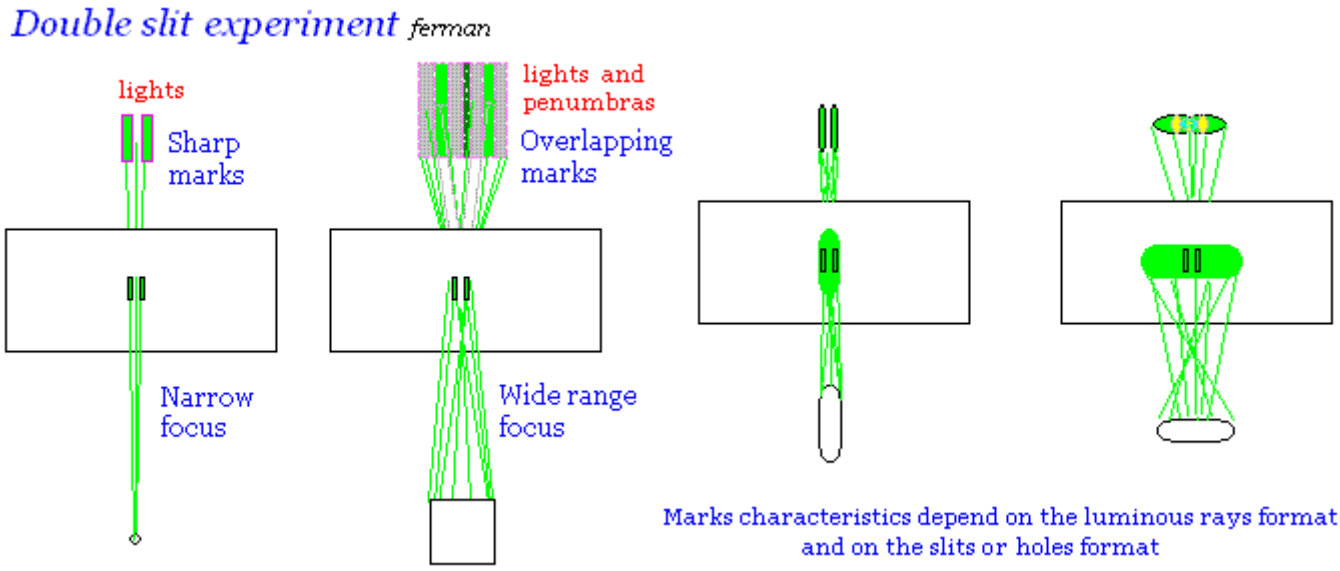
Note:
I have made the same experiment using a sunshine ray coming through a window and changing the dimensions of the beam from a minimum hole until a large hole and large slit, giving me the same explained results:



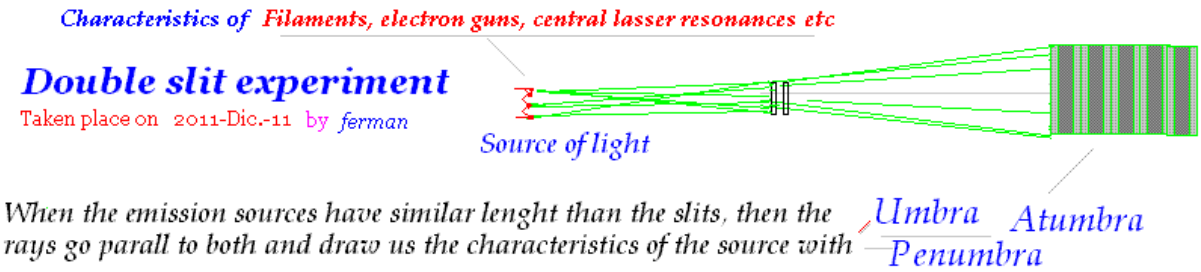
With a minimum and narrow solar ray the result has been equal than the anterior narrow beam, say, small marks, without penumbras and total sharpness.
With large hole, major marks and minor sharpness.
With large slit of entering bright, big marks and longitudinal deformation of the final marks.
Therefore the format and shape of the bright focus intervene and they are responsible of the form and structure of the final marks, conserving the principles of the camera obscura.
Any focal characteristic is developed in the final marks.
But here I don't have observed any type of wave interferences neither.

Focal overlap:

Focal overlap will occur when two (or more) projections of images or signals meet together overlapping some on the other ones (total or partially) on the screen of reception or impact.
And this is exactly what you see in previous experiments, simply overlapping bands, but not interference of expansive waves light, but overlapping of rectilinear corpuscular light rays.



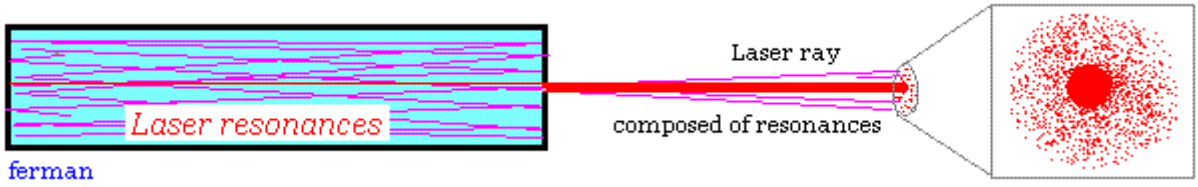
In the same sense, when the dimension of the slits are similar to the dimensions of the sources of emission (Filaments, electron guns, central laser ray, etc.), then the passing rays through the slits go parallel and can describe the characteristics and emission points that composes the source, given us several umbra, penumbra and atumbra (two by any point of emission).



Single and double slit experiment

Using Laser rays

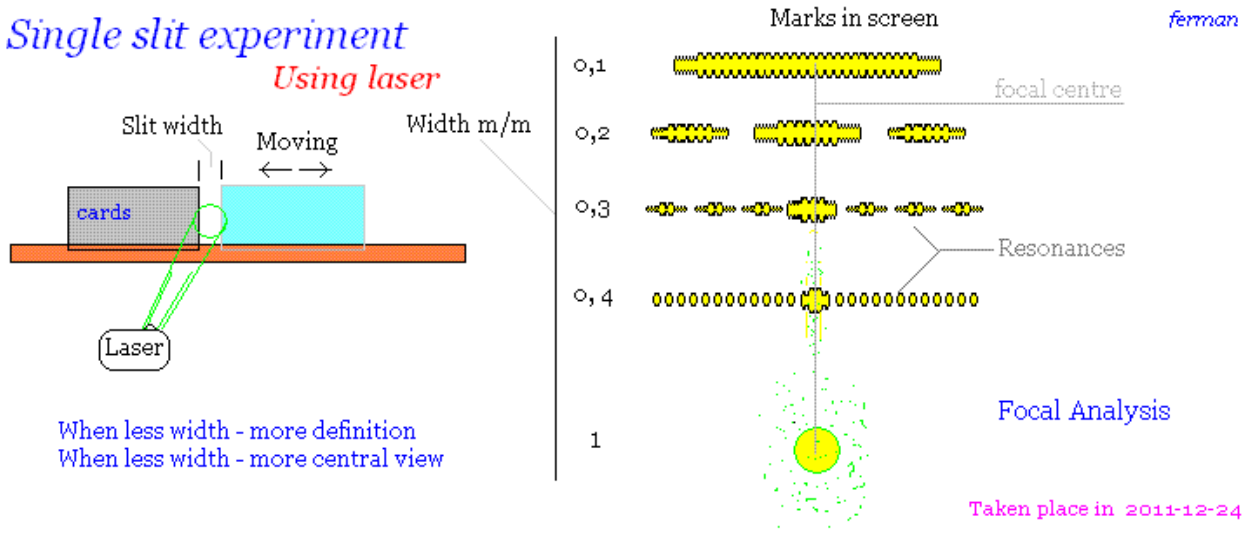
With laser, the assertion: "The experiments with the simple slit give us a single mark, and with double-slit give us multiple marks" seems to be incorrect.
In both cases give us multiples marks, depending on the slits aperture and number of slits.
Marks show us the laser resonances.



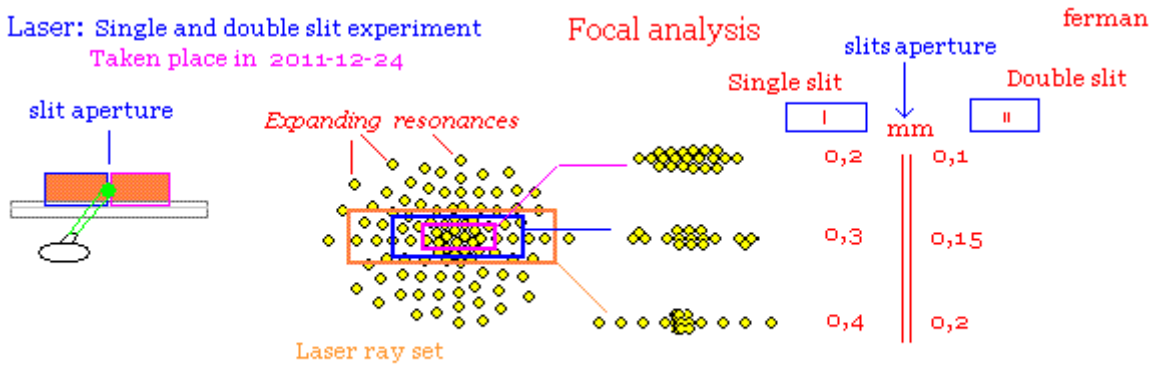
The first questions that we must take in mind are the peculiarities of the laser rays, always from the viewpoint of this author.
With the laser procedure what we try to get is a ray, as linear as possible, in order to preserve the luminous power for long distance.
Roughly, we can say that the laser is a mechanism consisting of a closed camera with two parallel mirrors, between which, we emits a bright ray continually reflect from one mirror to another and this way we will accumulate their power and at the same time the rays go take longitudinal alignment between the two mirrors.
One of these mirrors has a small hole in its centre, being the unique exit way for the light rays once refracted multiple times and aligned in longitudinal way.

However these refractions make that the outgoing ray is a ray composed of multiple resonances and exit phases, and therefore, it is not a ray of single phase, as it is often assumed. This circumstance would support the corpuscular nature of light.

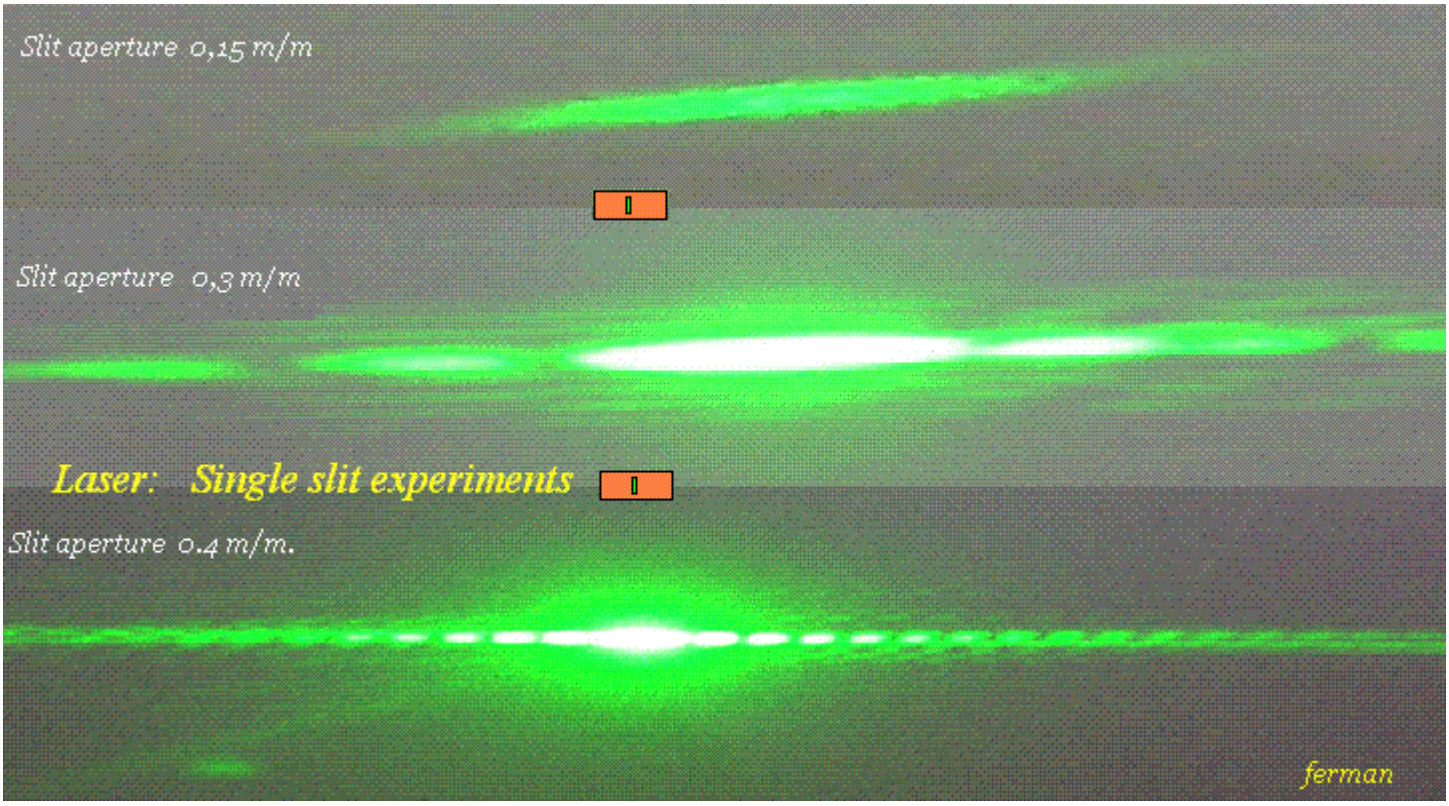
On the other hand, and supporting us is the properties of the Camera Obscura, we have to take into mind that to smaller holes or slits - greater are the definition, sharpness and clearly of marks on the screen.
And this circumstance is very important because it is at minimum aperture of the slits where the multiple bands of different resonance are observed in this experiment.



Say, at minimum aperture of the slit and due to the before mentioned property of sharpness, it is where the focal analysis of laser ray shows its multiple composition.
To higher aperture of the slit, the composed laser ray already shows us more diffused and compact.
Therefore, at minimum slit aperture is where we can observe the focal analysis of laser, ranging from simple vision of the center of the ray to the representation of their multiple longitudinal resonances.



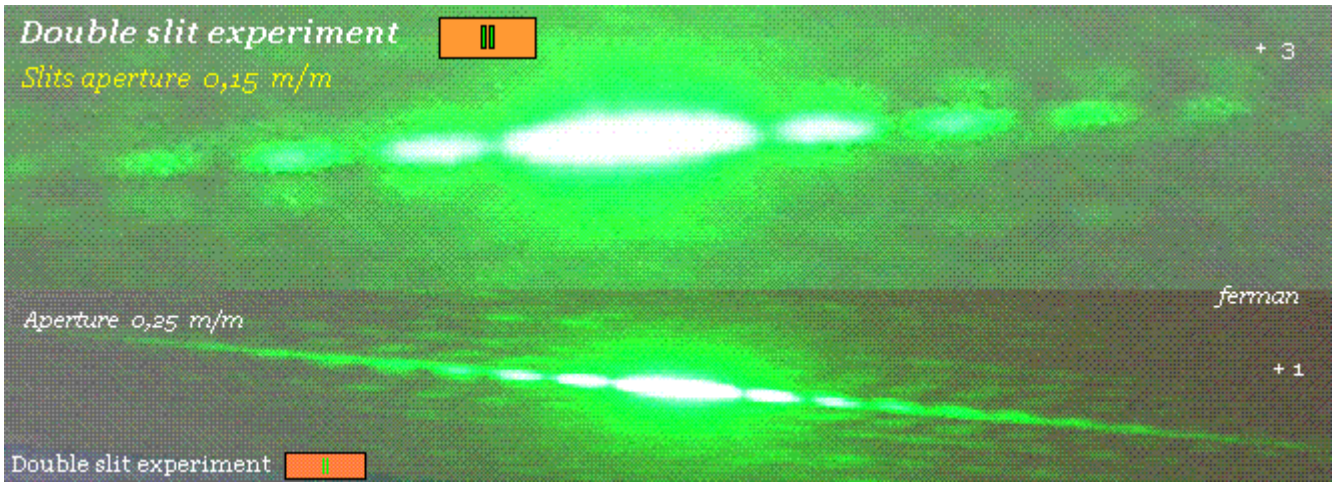
This can be seen in the above drawing, where the marks with different aperture of slit are represented.
Being the center of the laser focus the first thing that we see;
Then we will see this center of focus with the more nearby lateral resonances;
Later the center of the focus with more resonances;
And finally we can observe all the focus and their resonance forming a compact focal set.
If we continue to increase the aperture of the slit, the laser ray behaves similar to the narrow light beam than before we saw.



Therefore, and in the opinion of this author, what tests carried out with the laser show us are not the demonstration of the wave characteristics of light, but a simple focal analysis of laser rays.
If it was the wave characteristic, then this characteristic will give at any aperture of slits.

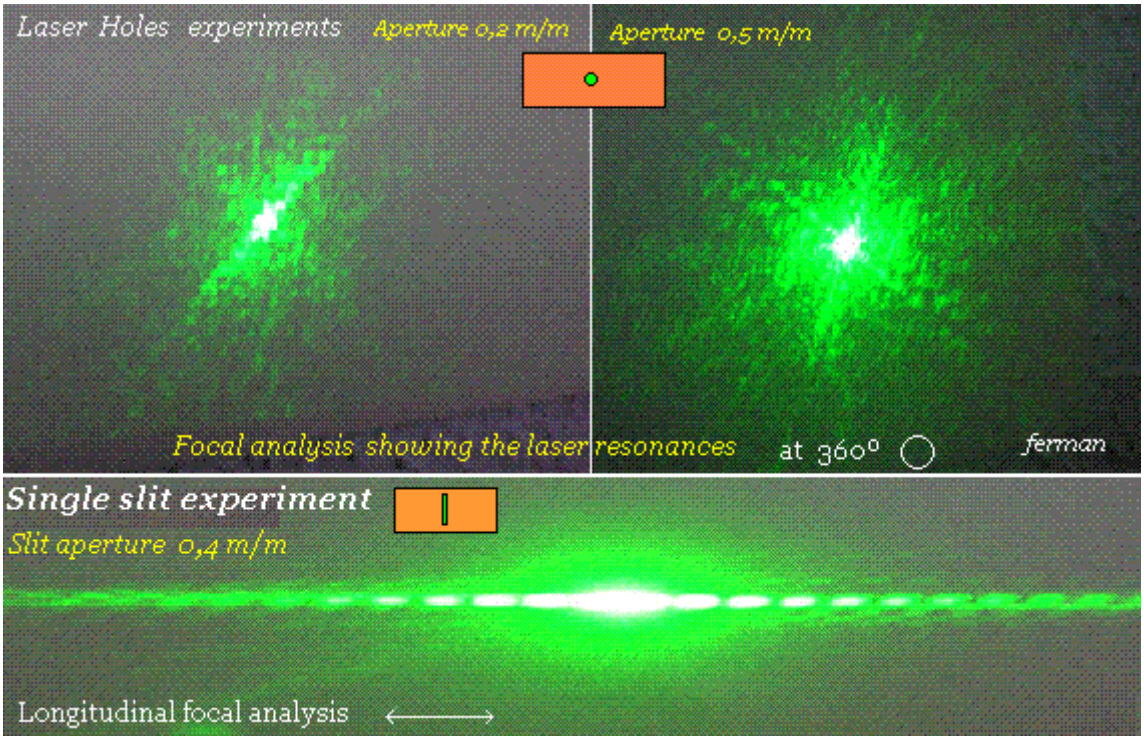
Laser: Double slit experiment

As we have seen, the marks in the experiment with simple slit depend on the width aperture of the slit, showing resonances starting from a minimum aperture.
Well, with double-slit resonance bands are slightly more numerous but nothing more.
Therefore, in my experiment don't appear important differences like a single mark for a single slit and many bands for two slits.
What we can observe is the sum of marks of two slits and not an explanation to the wave nature of light, but simple sum of marks corresponding to a corpuscular nature of light.



Focal analysis

If you open completely a window and look at the front wall, you can see all the light that enters through the window showing on wall.
Now, if you gradually go covering the window, you can see how the brightness on the wall goes weakening. But once you have just left a minimum uncovered hole, you see that on the wall it begins to draw dimly the outside landscape.
At this time the room behaves like a Camera Obscura, which draws us inside the outside landscape in inverted way.
This way it is now when the focal analysis takes place, to say, analysis of forms and external parts of the landscape of focus that are transmitted by the light, due to the sharpness and definition that now the light ray has.
If you continue closing the hole, and due to the thickness of the walls that form the hole, the incoming ray would be alone the one emitted by the centre of the exterior landscape and this way we can see alone reflected the central part of landscape, to finish closing the hole completely and disappearing the incoming light.
As well, in my view, this is what happens with the laser when passing through narrow slits: A successive focal analysis of the center and resonances of the laser ray according to these minimum openings of the slits.

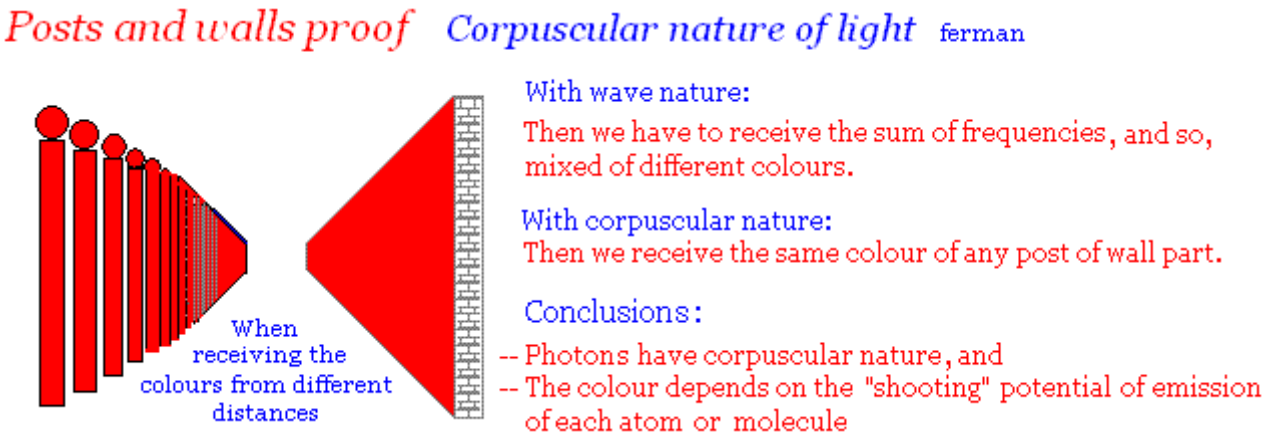


Summary of experiments

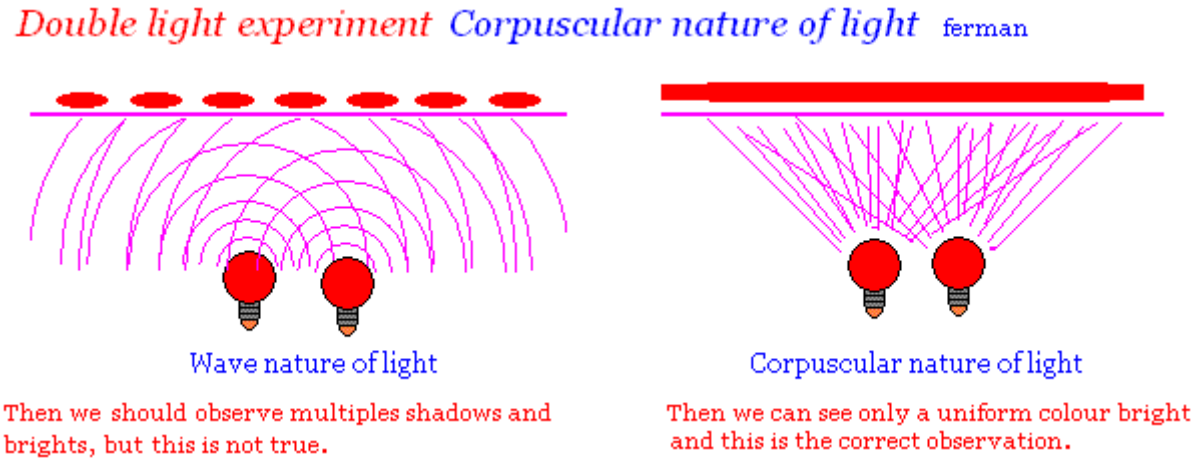
With the taken place experiments we can reach the following summary-conclusion:

1.- The carried out experiments indicate us that to study the characteristics of the light emissions we must to do it with the very narrow light rays because the wide light rays produce us shadows, penumbras and deformations of the marks that will drive us to wrong conclusions.
This is due to the properties of the Camera Obscura in which what we see on the screen is a representation of the focal shape, and if the ray is very extensive we will receive a complex set of information on the focal feature and its shape peculiarities in detriment of the real characteristics of light.
On the other hand lasers, contrary to what it is said, it is not a single phase light ray but a complex sum of resonances in different phase of coincidence when going each resonance reflecting with different departure time, different distances of refraction, different number of resonances, etc.
Therefore lasers are rays composed of multiple resonances, those which left showed in the screen at minimum apertures of the slits.

2. On the other hand, and with the different experiments above exposed, what we see in all of them including the laser experiments is that the results with the double-slit or double hole experiments always give us the sum of the results with the single slit or single hole experiments.



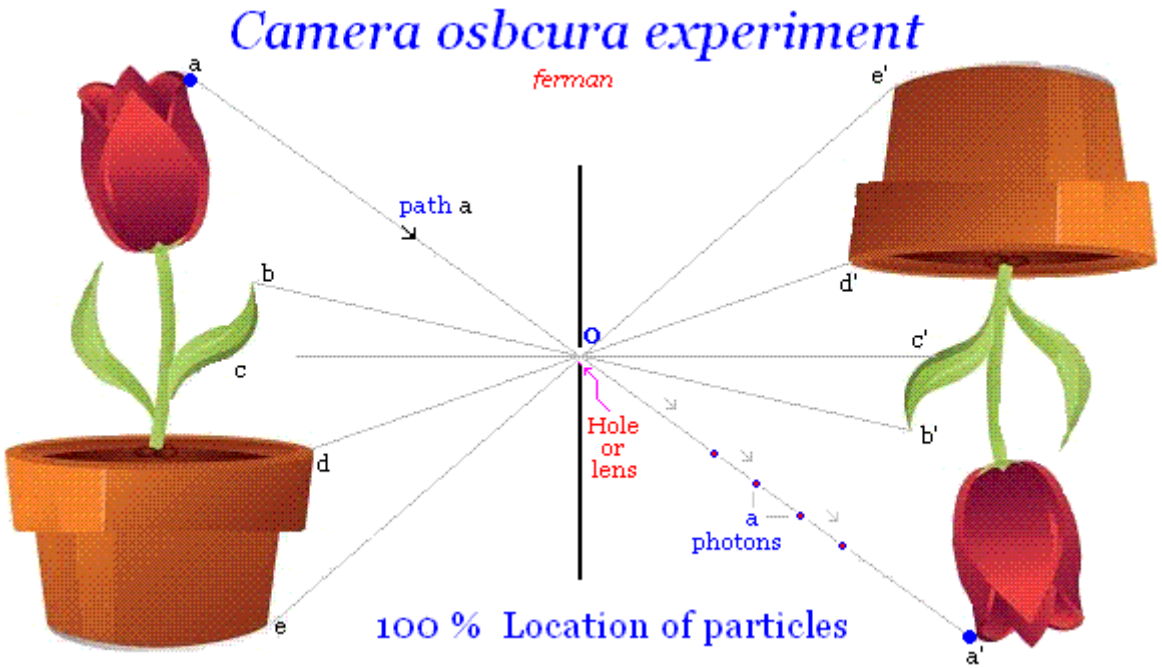
Therefore, our experiments follow several properties in the emission of light, those ones will be most widely confirmed with the studies of the Camera Obscura and other:



- Light has corpuscular nature.
- Double hole and double slit experiments can be explained by the previous conclusion, corpuscular nature of light.
- In these experiment light seems to be particles, but no waves.

The Camera obscura experiment.

Corpuscular nature of light.
Location and certainty properties of particles.



"Before Pythagoras, his theorem was not uncertain but unknown".

As we already know this old experiment, the camera obscura, we will not explain its components but yes, we will use it as a deductive method of important properties of the particles.
The drawing shows a hole (o lens) in a side of the Camera Obscura for where the photons emitted by any exterior object (flowerpot) can pass toward the interior.
In a screen inside the camera obscura, the object is built in inverse position, question that is very important as we can see later.

Let's see the main questions:

The corpuscular nature of light.

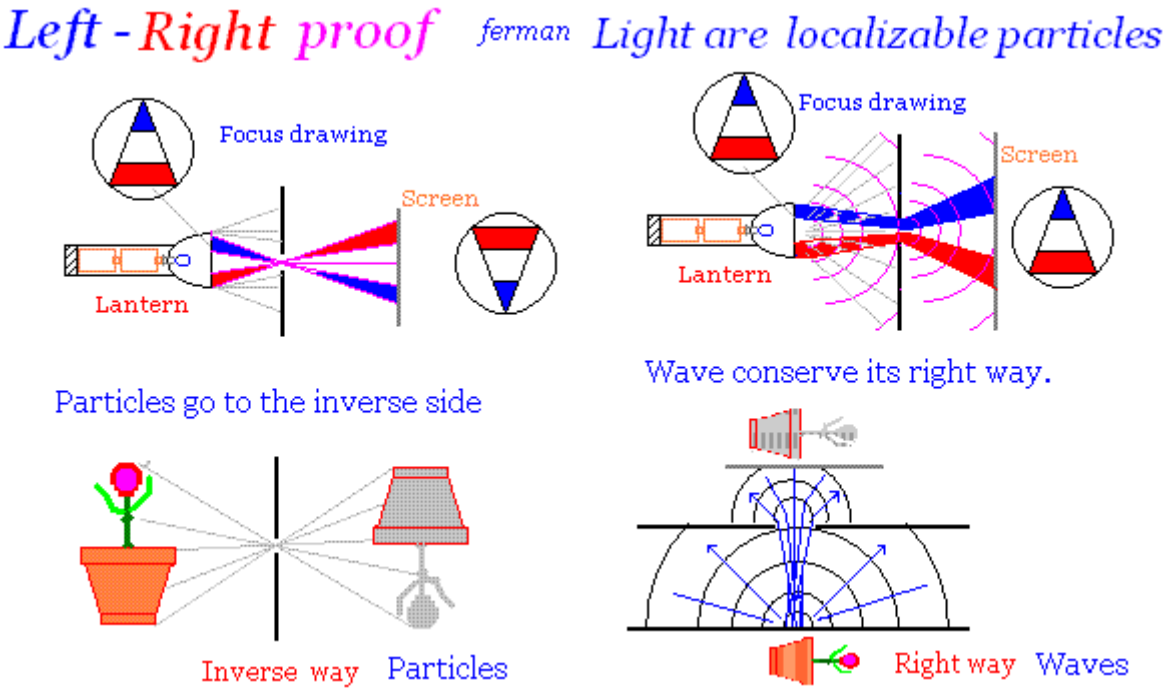
Let's start looking to any point of the observable object (flowerpot).
Any of these points emits photons rays or light, those which have to penetrate through the hole or lens of the camera obscura to build the image of the flowerpot in the interior screen of this camera.
If we observe the photons of certain point, i.e. a point, to create the correct figure in the screen these a photons have to go in straight line from the a point, passing by the hole or lens, and ending in the a' point of the built image, in inversion form, of course.
* Important: I say in straight line because if they go in curve line they never could build the figure correctly.
The same happens with the point b and with all the other ones.
So, all the points that create the figure in the interior screen have to conserve continually invariable direction and all type of ordination among them to produce the flowerpot figure.

If we study the route of any photon (e.g. a-a' tour), we see how their situation at any time is fully reachable.
And not only their situation, but measurable speed, momentum, etc. Say 100% location in every time through its route.
The same occur in each and every one of the routes of the photons that draw us the flowerpot on the interior screen.
But also among them, all photons are perfectly situated, sequenced, etc., from their departure to their impact on the screen.

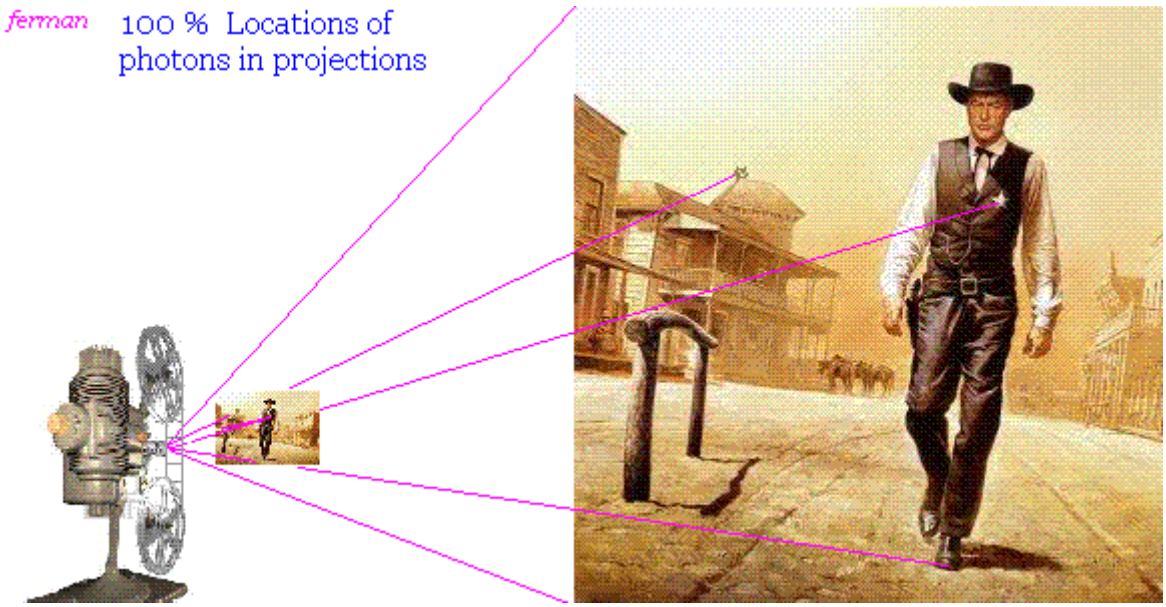
But this circumstance of management or location of photons occurs about the cosmos at all times.
Thanks to this location, we can see all the objects of our surrounding, because if there were delocalization of the particles, it could not exists any phenomenon of projection of imaging, visualization of images and objects, etc.

Conclusions:

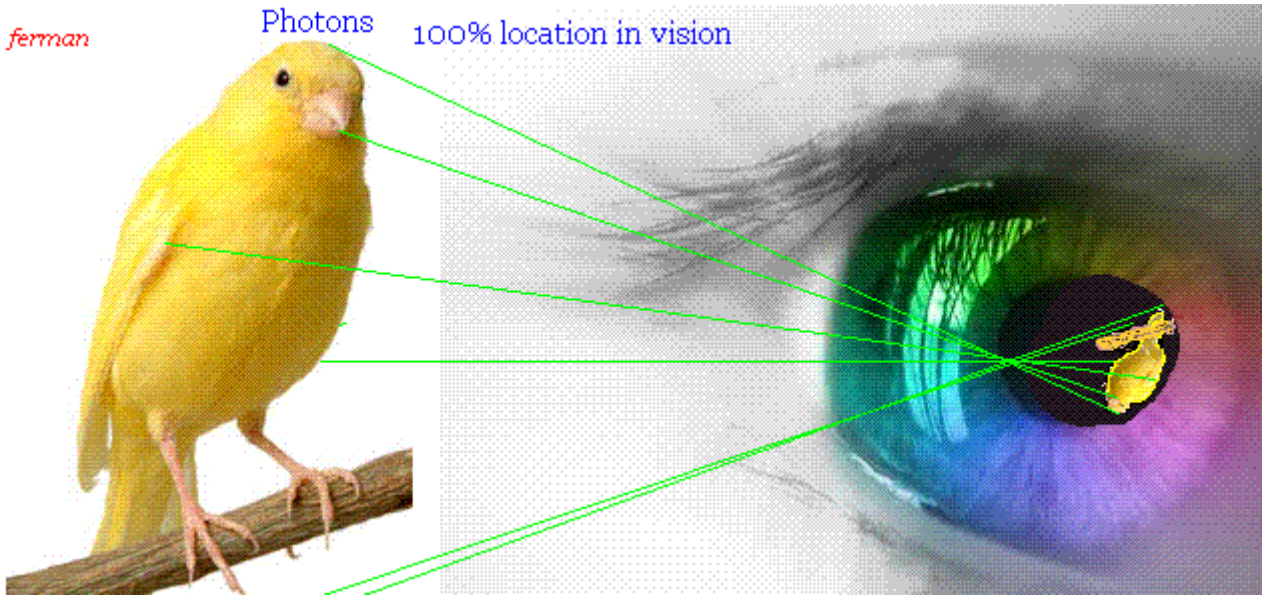
1.-Photons are corpuscles. If the photons were waves, these would be infinite because infinite are the points of emission of photons in the image of the flowerpot and therefore intermingled along the way and never could compose an exact figure of the flowerpot.
But furthermore, when being photons particles they must to move in a straight line and they go to the opposite side in the building of the image, say, in inverted position, while waves held their position of not inversion.
This can be seen in any of the examples and drawings of the experiments of single or double slit with waves in fluids. We also can see it in the following drawing.



2. Photons and therefore particles have the location quality.

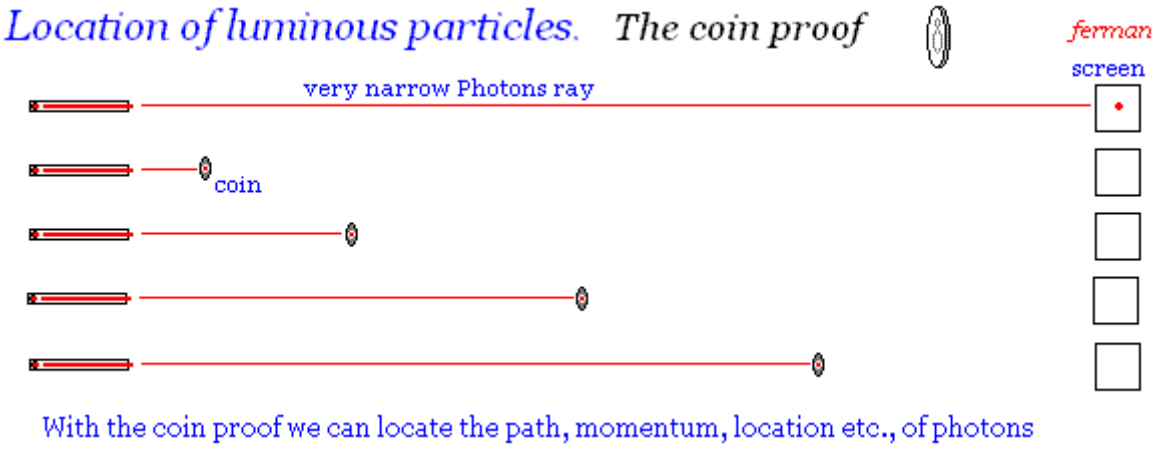


As we see, the photons along their way, going and passing toward the hole or lens, arriving and building the figure, all they are perfectly located to 100%.
We cannot say, as in quantum mechanics, that a-a' photons have some possibility of finding them in such site, or not; they will always have a tour and some termination without delocalization.
And as an example of the location of particles and in particular of the photons, we have endless evidence of this including all phenomena of vision, transmission of images, etc.



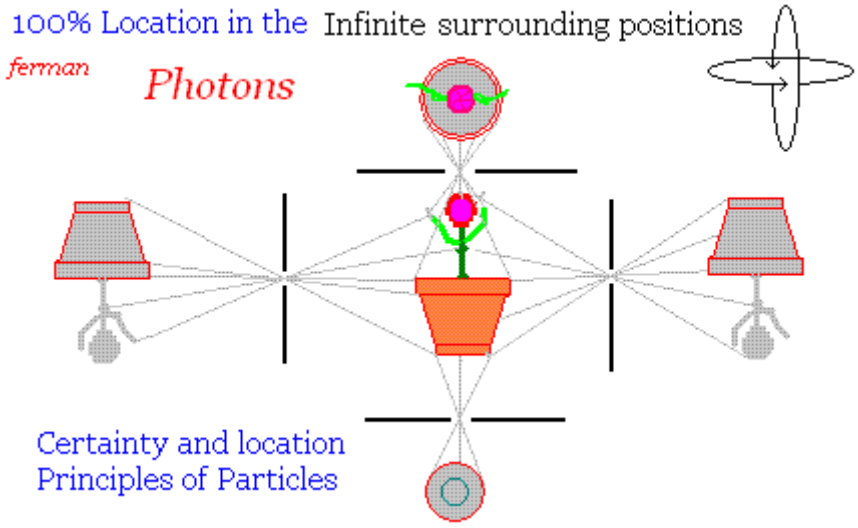
And finally, we would be honest.
We would not say: "The particles have the characteristic of the delocalization", when we can't have the necessary methods to reach them. Simply we don't have capacity to do it.

Therefore I believe that with these two experiments of the double-slit and camera obscura, especially with this last, so as with all of the examples of emission or projection of images, vision, cathodes rays tubes, etc., it last demonstrated the unique corpuscular nature of light and other particles, so as the certainty and locality of the same ones.



Certainty and location principles of particles

If you look again at the experiment the Camera Obscura and extend its application making it rotate around the flowerpot in all the infinite surrounding points, we can check that all of them complete the location property and all the photons emitted by the Flowerpot can be locate with this experiment.
The same will occur with all the objects in the universe.
After of this, we can extract and express a principle or fundamental property of particles.



Principle of certainty and location of particles:
"Particles have the property and characteristic of certainty and location, question that can be proven if we have the required resources to do so"

And to finish, let me remember the anterior example:
"Before Pythagoras, his theorem was not uncertain but unknown".
So, the uncertainty and delocalization are in our mind, bur never in the physical universe.

Let me a last no-quantum thought:
"Thinking that things and physical circumstances don't exist until we get discover or observe them, is of such stupidity, hubris and egocentrism that only those lacking in intelligence, sensitivity or humility can continue this belief without feeling true scientific shame."

And to finish let me put a single consideration:

Important question:
If light were waves, these must to unite forming composed waves what impedes the images definition and vision of things.
The vision and definition quality needs of the emission of light in individual points of particles (photon) that defines us all and each one of the points that compose an image or landscape.

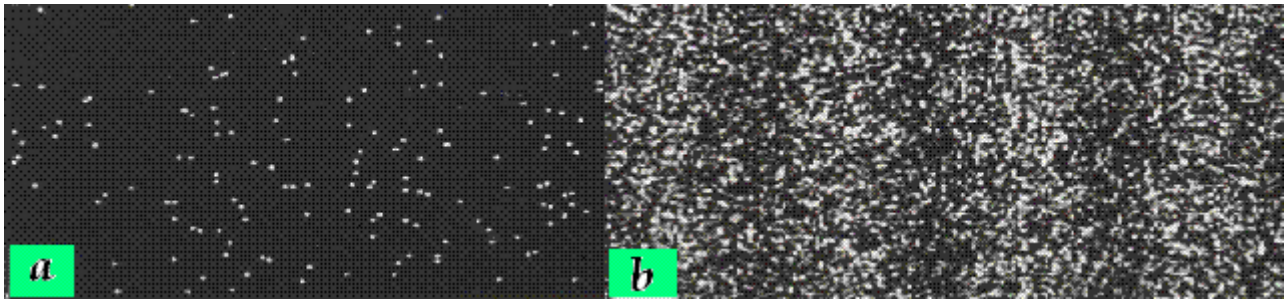
(**)

The current conclusions about the double slit experiments are erroneous.

I think the current conclusions about the single and double slit experiments are erroneous, and this is a lot of rare and suspicious because at simple view we can observe important errors of appreciation.
It seems as is previously we have the preconceived idea of demonstrating the wave nature of particles, without taking in mind any result that could say us the contrary thing.

So, let me to expose the conclusions that I draw from these experiments:

In these experiments the particles are emitted in sequential way, one after one, in distinct time of emission each one of them.
Later on, we go observing the successive impacts of particles on the screen.
From these observations we can draw clear conclusions, the main of them will be:

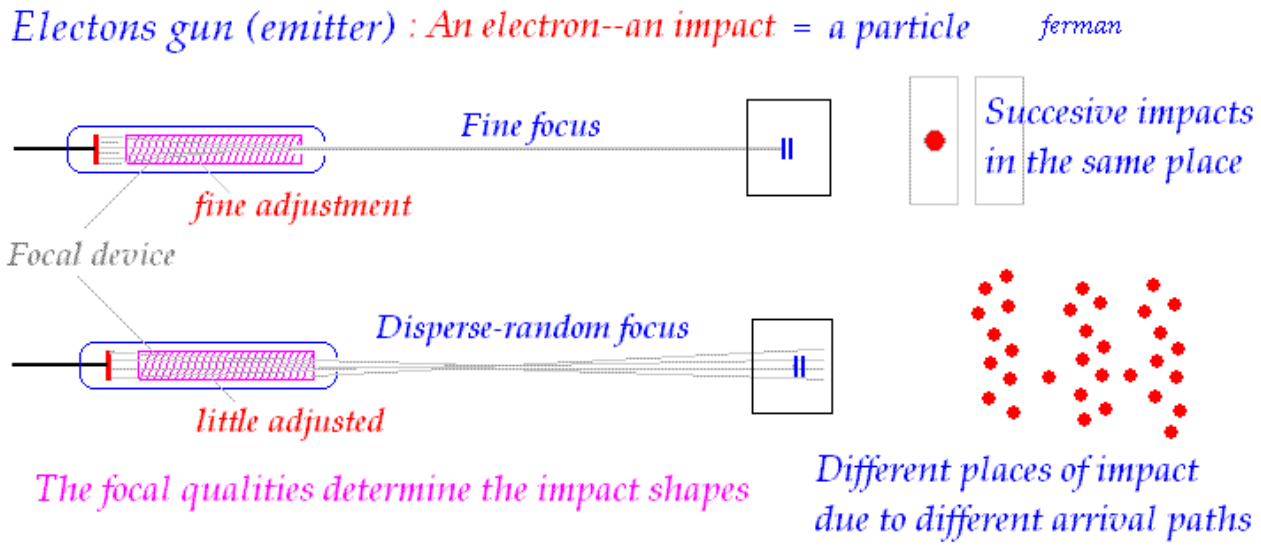


1.- Each one of the emitted particles produces a unique and clear point of impact.
So, it is clear that this unique impact point is produced by a unique material particle, because if the particles were waves it will be produced luminous fringes through any and each one of the slits and never a unique impact point.

2.- When being emitted the particles sequentially, one after one, the pretended waves couldn't have interrelationship among them, neither to produce compositions of waves due to, at any determine time, in the impact screen alone one and only one wave exists.
So, it is also clear that we alone make emissions of material particles, but no expansive waves.

3.- In the emission of each particle we can observe as this particle pass through one and only one slit.
So, it is not possible the interaction among particles (o pretended waves) that pass the two slits at the same time.

Then, what is the explanation to the different accumulations of impacts that are observed in the screen?
Because the wide range of the emission focus that emits particles in several directions, those which impact so much in the slits, as well around the plate that contains the slits.
To say, and as up it is explained, we have used a wide range focus of emission of particles and not a narrow focus with alone a straight line of emission.



Thank you friends. Ferman. 2011-11-20