

Introduction to Photonics
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Diffractions and Interference Lab Demonstration

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Hello everyone. My name is Nirjhar and I am T A for Introduction to Photonics course.

So welcome to the lab session of Introduction to Photonics course. So today we are going to do the experiment of diffraction and interference of light.

So we will see both the phenomena, what we have seen in the class same thing we will see here. So as you already know that diffraction is just light bends at the sharp edges and interference is like 2 light waves interfering depending upon their phase, so same phenomena we are about to observe here.

So guys this is optical breadboard.

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It is used to hold the components. It has small holes

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if you can see. I am not sure. So it has small holes to hold the components.

So generally the components, so there will be a component holder here.

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So you just place the holder.

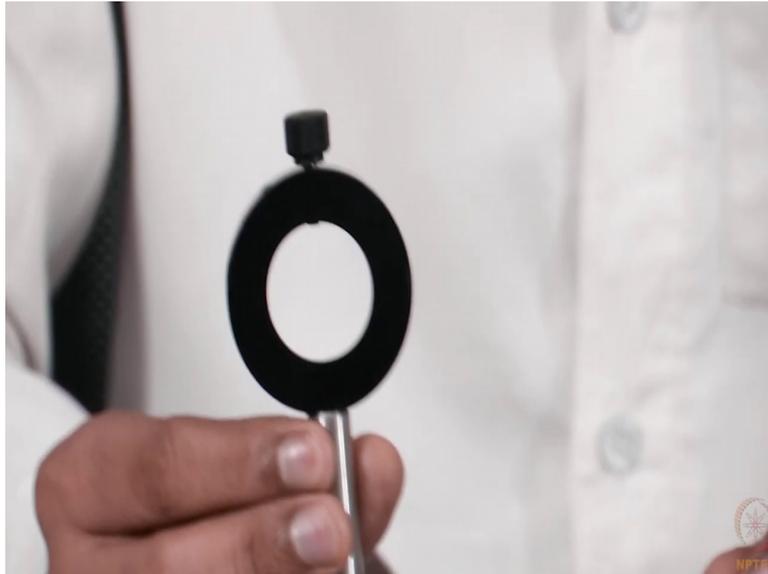
So this is post holder.

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So this is post.

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So, so basically I have few diffraction cells here.

So this is diffraction cell. It has one small slit in between, Ok.

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It goes and fits into this.

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And then you can tighten

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it. Now you can put it on the mount.

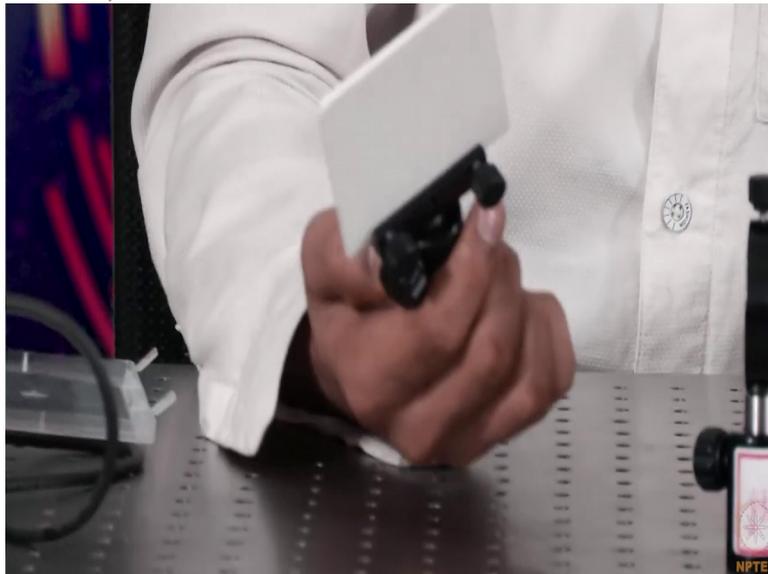
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So this is our slit.

So similarly I have the screen

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to observe the interference happening. So this is screen.

So it is on the post. And you can fix the screen anywhere on the breadboard.

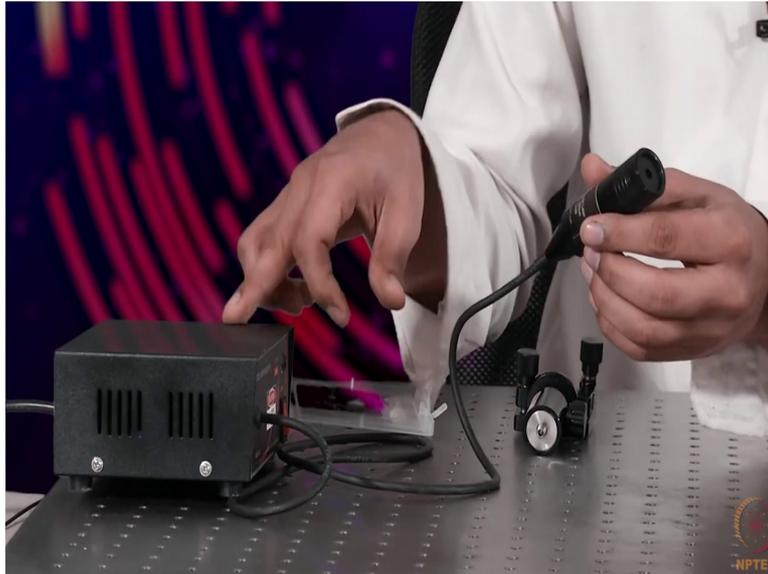
And the most important thing that we need here is a source of light. And as a source of light I have a LASER light.

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So this is a LASER driver. And this is LASER light, Ok. Once I switch it on

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I can get a LASER source from here.

And this is LASER mount to mount this LASER. So it is on a holder.

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So just put the kinematic, this is kinematic LASER mount. So now this is optical, complete optical setup.

Now you can

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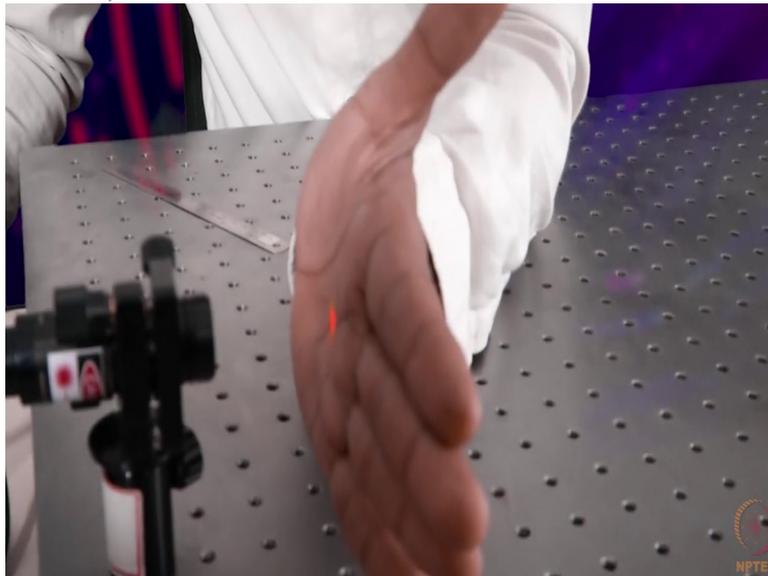


switch on the LASER light.

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This is approximately at the center now. So this is the final setup.

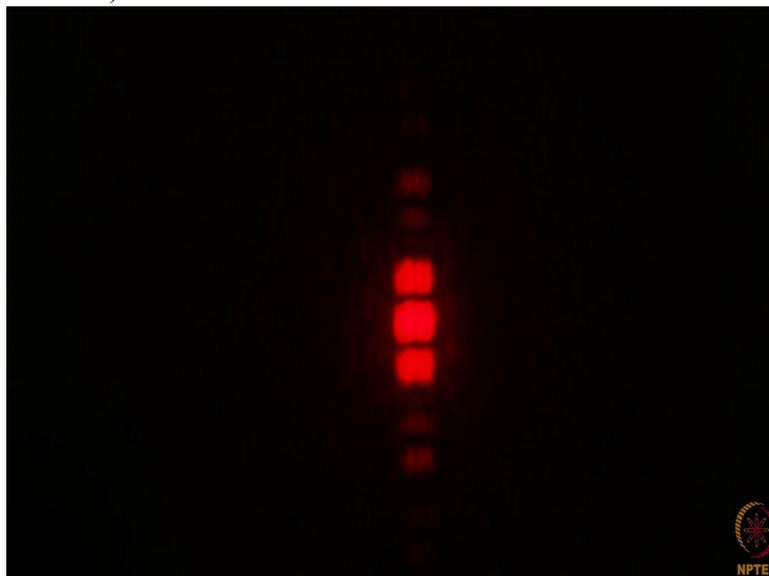
And now to the diffraction cell mount, I will put the diffraction cell, which is a double slit here. So

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this is double slit I am placing it in here. You can see the diffraction pattern for the double slit.

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And this is the interference pattern we are getting for double slit.

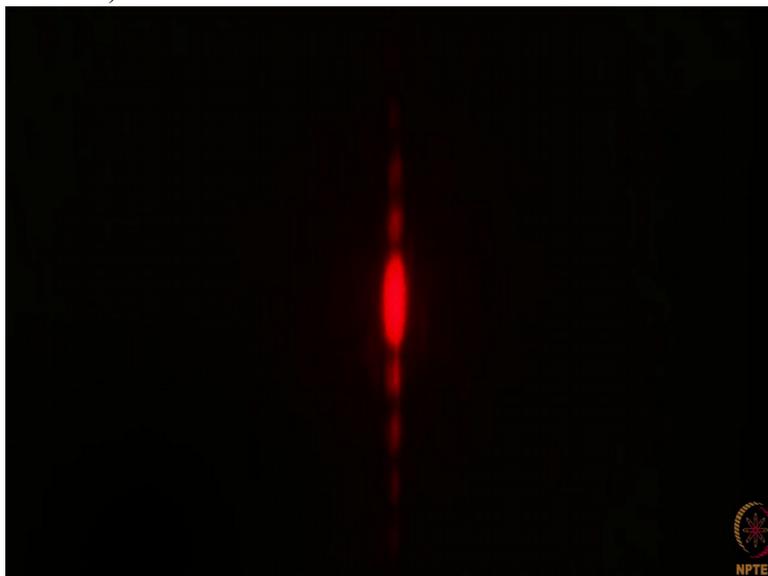
So if I remove double slit and now if I put a single slit over here,

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now you can see the difference. So you can still see the patterns over here being formed from the single slit itself. So this is

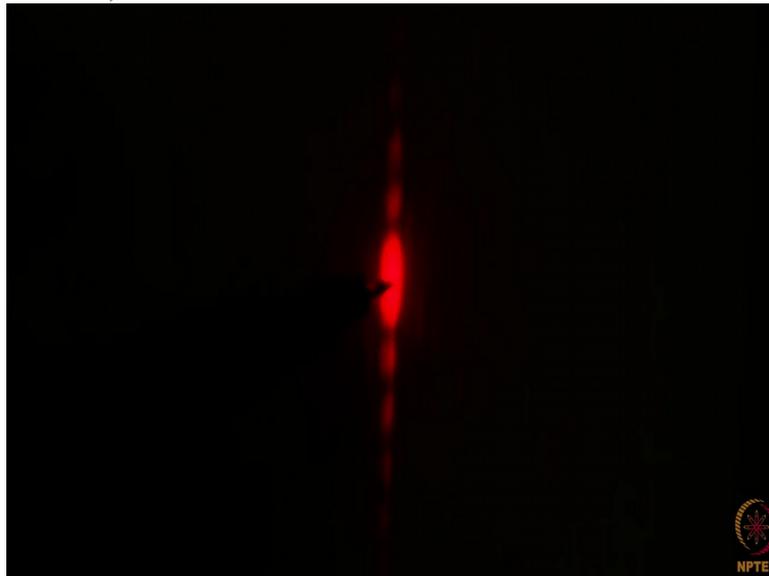
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interference pattern we are seeing for the single slit.

So now if I point the central maxima, central maxima is

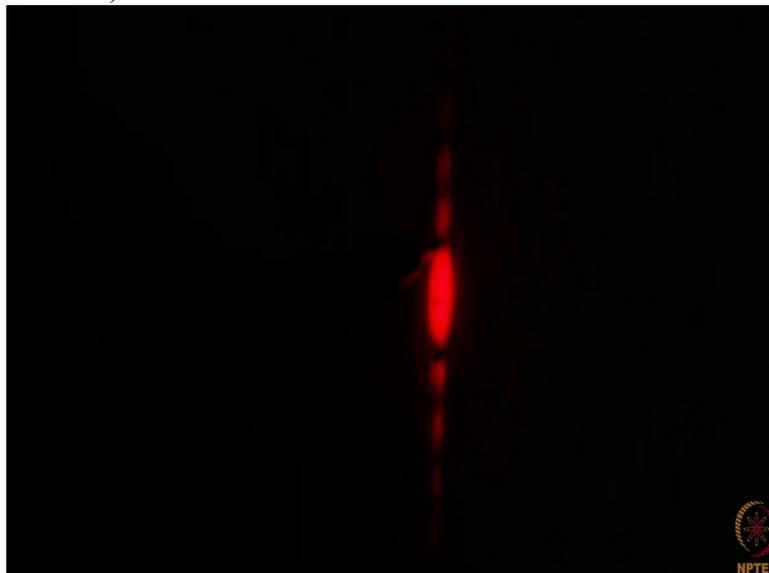
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somewhere here.

And this is the first minima on both, on one side, other side this is

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the first minima.

And here second minima, second third and third fourth, and fourth till fourth it is visible so that we can mark.

So what I will do is I will just remove this from the post. So both cases we are observing interference here.

But in this case interference is from the single slit, light source, are bending at the edges of a single slit and forming interference pattern but in double slit, light was diffracting from the two slits and forming interference pattern here.

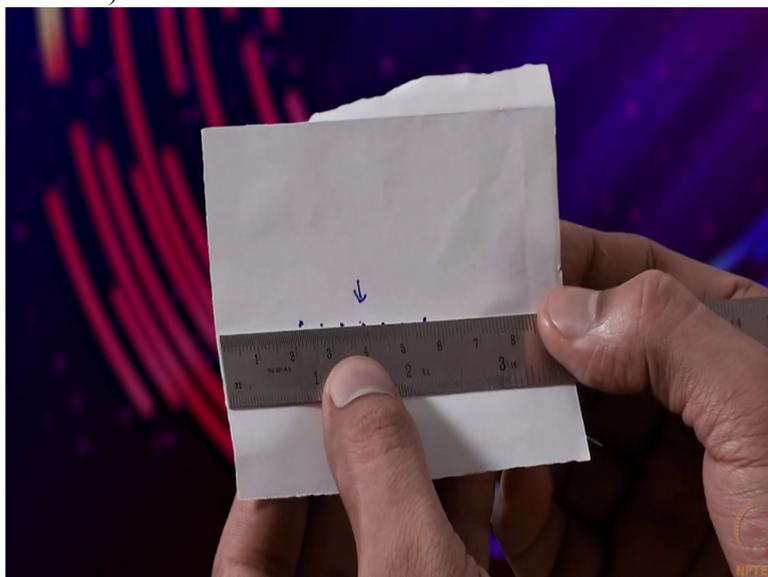
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So this is the diffraction pattern due to single slit that we put on a paper. So this is central maxima and all others are minima positions.

So I will just put a scale for you, if you can get any reading from the scale you can

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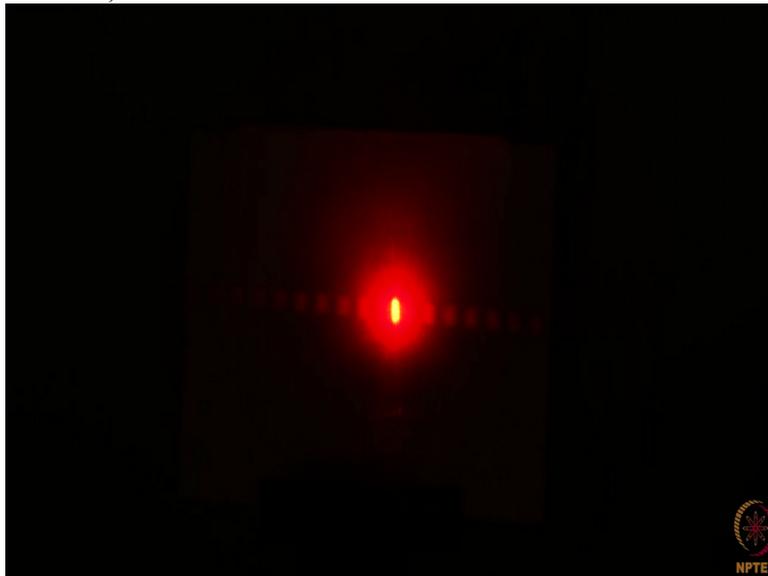
do this for yourself as well. So now, now if I put a simple wire, just a wire and if I put it,

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this wireframe over here, you can see the diffraction pattern for the wireframe.

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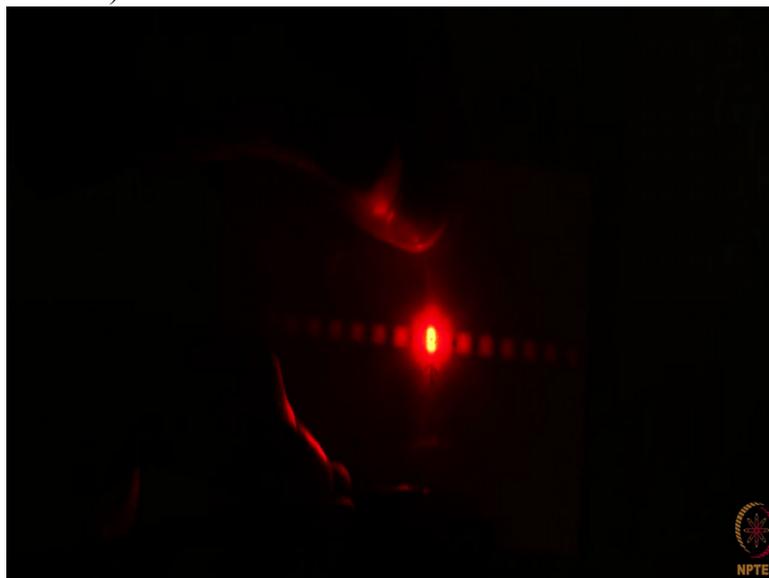
So this is diffraction pattern due to a single wireframe. So now you can see this is central maxima,

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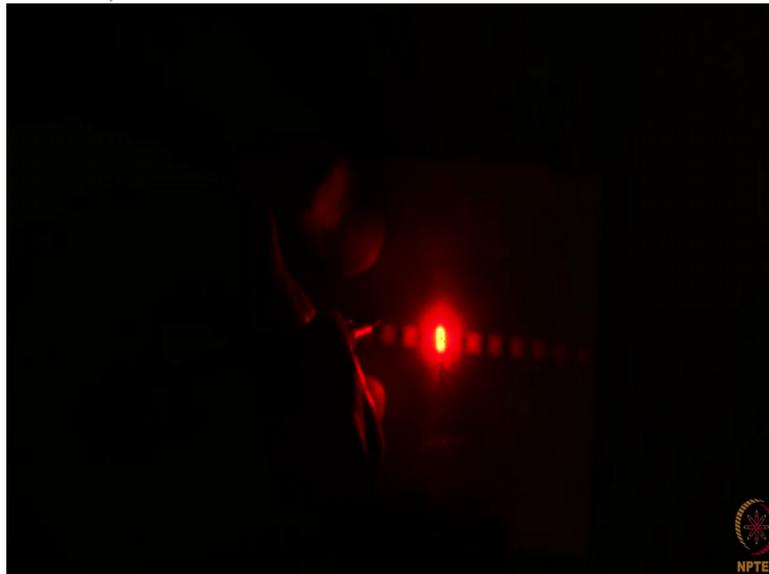
and this is first minima here, second minima, third,

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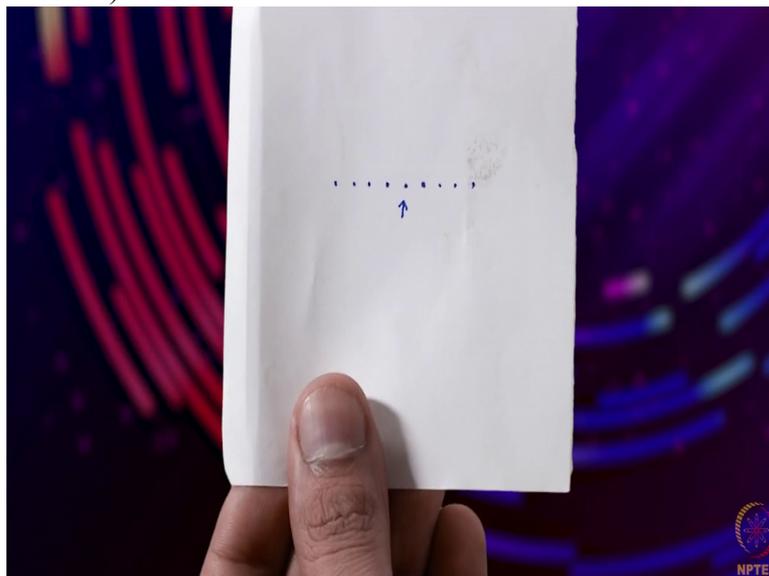
so now once more a (()) (05:05) second, one by here, one by here,

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somewhere. This is diffraction pattern

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for a wireframe.

So now if we also do the same for you, and I put a scale. You can see here again central maxima as in pointed with the arrow.

And now

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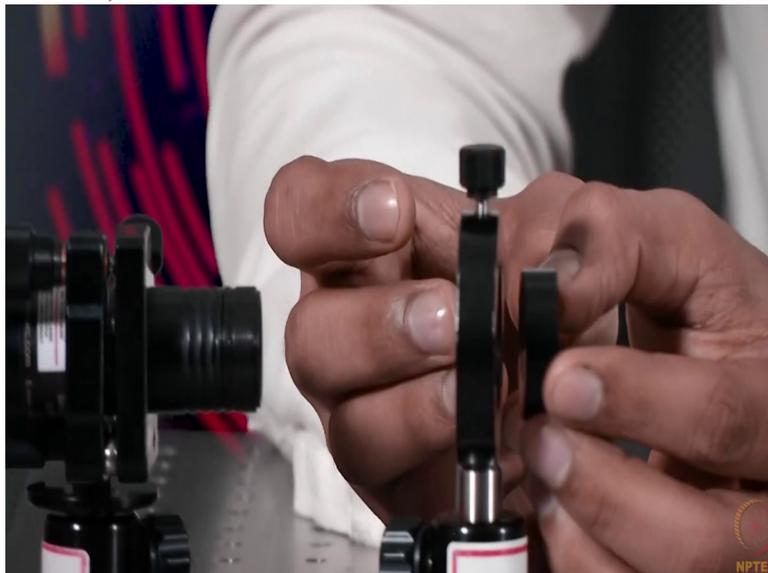


if I put a scale and if you can see the scale you can again do the measurement and find out the width of the wire, diameter of the wire from the formula given in the manual.

Ok, it is similar to the single slit. All the calculations will be similar. So you can do it for a wire. And similarly you can do it for human hair or any single string, small thin string of wire.

So now if, this is a circular aperture as I had shown you earlier

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and so now see the diffraction pattern due to the circular aperture. This is

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our circular aperture and this is diffraction pattern that we get for circular aperture.