

MITOCW | Optics: Fraunhofer diffraction - two slits | MIT Video Demonstrations in Lasers and Optics

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SHAOUL Now we're ready to look at two-slit diffraction patterns. What we have here is a slide. And on this slide, we have
EZEKIEL: pairs of slits.

The individual width of each slit is 100 microns, and the spacing between slits varies anywhere from 150 microns to 2 millimeters. The only thing we've added to the previous setup is this lens in order to expand the beam so that we can cover both slits. So let's first look at the diffraction pattern associated with a single slit. Now, if we look at the screen in close-up, you can see we have a single-slit diffraction pattern.

As before, the circles are 5 centimeter markers. And in addition now, we've added the little squares, the two squares. And that denotes the separation between the 0s of the central lobe of the single-slit diffraction pattern.

Let me remind you that the spacing between the slide here and the screen is about 200 centimeters. And we're using 6,328 Angstrom light. So you have all the tools needed, then, to calculate spacings and what have you.

So now, let's start by looking at the smallest spacing, which is 150 microns. So indeed what you see is that the single-slit diffraction pattern has been modified by the addition of the other lobes, of the smaller lobes. And this is for 150 micron spacing. Remember, each slit width is 100 microns.

Now, let's go on and look at 175. Well, 175 from 150 is not much of a change. So we don't expect to see much narrowing of the small lobes.

Let's go on to 200. Here, you're beginning to see that the lobes under the single-slit diffraction pattern are now narrower. And now 300 micron separation-- here it's clear. They're getting they're getting narrower. In fact, you have about five of them or so under the central lobe of the single-slit diffraction pattern.

Now let me go on to the 2,000, or 2 millimeter spacing. And at first, you think there's no little lobes under this single-slit diffraction pattern. But all we have to do here is get the camera to zoom in.

And as it zooms in, you begin to see that indeed, there is structure there. And if your calculations are correct, you'll be able to show what the spacing is for a 2-millimeter slit separation. Now, in the next demonstration, we're going to show the Fraunhofer diffraction pattern associated with many slits.