MITOCW | Optics: Plane mirror cavity - diverging beams | MIT Video Demonstrations in Lasers and Optics

PROFESSOR: Now, we're going to see what happens when the beam going into the cavity is an expanding beam. What we've done, we've added this lens to the setup so that the beam leaving the lens is an expanding beam. And I don't know whether you can see it that well on the card, but the beam is an expanding beam. It goes into the cavity, and they transmitted beam then goes to the screen over there.

And if we can see it in close-up, we can see that we have rings instead of the spot that we had before. And as the cavity length changes, the diameter of the rings change. As you can see in the insert.

Just as a special treat for you, we're also going to look at the reflected light from the cavity. Again, we've added this beams splitter here so we can sample the light. And then, we'll go from the beam splitter, onto this mirror, onto the screen. Now, the spot on the left is associated with the reflected beam, and the spot on the right is that associated with the transmitted beam.

Now, you can see that they're rings. Both of them are rings. In the transmitted beam, the rings are bright. In the reflected beam, the rings are dark.

Now, what I'm going to do is take off the scan and do the scanning by hand. Now, let's go back and look at the two sets of rings. You can see, as I push a little bit, that the one on the right, let's say, when it goes right, the one on the left is dark. I can also do it by applying a voltage to the piezoelectric crystal, again, by hand, and vary it by hand.

And you can see here that, again, the one on the right, I can make the central spot bright. You can see the one on the left, or the reflected beam, is dark. And when the transmitted beam is dark in the center, the reflected beam is bright. So indeed they are opposite one another.

Now, the interesting thing is, first of all, why do we have rings? And also, why the behavior is as shown? And, again, this is left to you to think about.

In the next demonstration, instead of using a plane parallel cavity, as we've used so far, we're going to use a cavity with curved mirrors. And I assure you it has lots of interesting things for us to learn from.