

## MITOCW | Optics: Fringe contrast - intensity ratio | MIT Video Demonstrations in Lasers and Optics

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**PROFESSOR:** Now, I'm going to discuss another method of reducing fringe contrast, and this one is associated with the intensities in the two arms of the interferometer. Let's look at our present setup. And again, let's look closely at the fringes. And we see the good contrast that we've had before.

Let's check on the intensities in the two arms. So what I'm going to do here, block one arm. You can see the intensity of one arm. And then block the other arm, and you can see the intensity of the other arm. Again, you can see that the two intensities are pretty equal, and we get pretty good contrast.

Now, I'm going to change the relative intensities in the two arms by putting an attenuator. Here is an attenuator that I'm placing in this arm, so that the total attenuation in the beam coming out of this arm will be a factor of 10. Let's look at the intensity coming from this arm. You can see, as before, it's pretty bright. Let's look at the intensity coming from the other arm, and it's attenuated by a factor of 10.

Let me remove the card, and let's look at the interference pattern. And then you can see that the interference pattern here is a loss in contrast, especially in this area around here. The good contrast over here can be explained, but I don't want to go into it right now. But the one that we're interested in is the bad contrast around this region. Because if I take this out-- take the attenuator out-- good contrast comes back. If I put it in, I get that poor contrast on the side.

Now, to go further, I'm going to put a bigger attenuator. This time, I'm going to attenuate the beam coming out of this arm by a factor of 100. So again, let me show you the intensity in the other arm. As it was, before pretty good. If I look at the attenuated arm now, you can't even see the beam at all. I've attenuated by a factor of 100.

Let me remove the card so I can look at the interference pattern. And you can still make out a little bit of interference. The contrast is very poor, but at least you get a feel that there is interference going on with full contrast, because the two intensities are unequal. And again, if I take it out, you can see the contrast is back. Put it back in again, and the contrast is very poor.

So, in conclusion, if you want to get good contrast in the fringes-- and that's where the information is-- you have to make sure that the intensities in the two arms are equal. Otherwise, you have poorer contrast.