

MITOCW | Laser fundamentals III: Tunable dye laser | MIT Video Demonstrations in Lasers and Optics

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PROFESSOR: Now, I would like to demonstrate to you a very widely tunable laser. In this gates it's a dye laser. The dye being rhodamine 6G. When pumped with an argon laser, the dye laser can be tuned from light green, to yellow, to orange, red, and even deep red, using just that one dye. So in this demonstration then, what we're going to do is fire up the dye laser, and then tune it so that you can see all these colors right on your screen. Again, you have to be careful and make sure that your monitor is is adjusted so that you can see these colors.

Now, the dye laser is right here behind me. And when we come back, we'll have it all set up, ready to show you those beautiful colors that come out from this dye laser.

Now, on the left you see the argon laser pump that pumps that dye jet. Now, as we zoom out, we see the entire ring dye laser. So let's look at the dye laser in more of a close-up. Here's the pump coming in into the dye laser. Here it is.

Here's the argon laser pump. And the pump gets focused into the dye jet over here. The fluorescence from the dye jet then is picked up by mirrors close to the dye jet and then sent around this ring cavity. There's one mirror here, here's the laser beam, and here's the other mirror here, and then the other two on either side of the jet.

So here's the output of the dye laser. What we're going to do with it, we're going to pass it through a diffuser to dramatize the display of the color. Here's the output of the diffuser. And I'm going to let it fall onto the screen over there.

Now, right now, the dye laser is putting out an orangish sort of color, as you can see on the screen. So, now, I'm ready to tune the dye laser so that we can observe this huge tuning range. And in order to tune the laser, we have inserted a birefringent element over here. And just by simply adjusting the angle using a micrometer, we can tune the wavelength of the laser.

But first let me remind you that the colors you're seeing depend on the setting of your monitor. Right now you should be seeing orange. Now, I'm going to tune either side of orange. Now, I have yellow and going towards greenish-yellow. Here we are.

On the screen, I see light green color, and I hope you see that also. So here we are from light green. Now I'm going to turn towards the red. That's becoming yellow, now orange, and now even a stronger orange, is becoming reddish. Now it's nice and red, and we're getting, in fact, deep red over here. Again, I hope your monitor is going to show you this huge, huge turning range.

Now, we'll go back again to red and orange. Now we have yellow and then light green. All right. Now, let me just also remind you that the tuning range that you've seen is about 10 to the 14 hertz. That's a huge, huge tuning range.