# MITOCW | Laser fundamentals III: Dye laser induced fluorescence in iodine



**SHAOUL EZEKIEL:** In this demonstration, we're going to illustrate in a simple way how molecules absorb light and emit fluorescence as a result of the absorption. We're going to use the dye laser, which is over here. And we're going to go, for molecules, we're going to use iodide. That's molecular iodine in a vapor. And what we'll do, will tune the dye laser in wavelength as it passes through the iodine vapor cell and observe the fluorescence as a function of dye laser tuning.

Again, in order to observe the colors correctly, you will have to adjust your monitor so that the colors come out as close to what is supposed to be as possible. So now, we will get the dye laser fired up so that you can observe the iodine fluorescence.

Now we're ready to look at fluorescence in molecular iodine induced by this tunable dye laser. So here we see-- again, we see our dye laser. And the beam from the dye laser, here it is on my little card. The beam from the dye laser, then, is passed through this vapor cell of iodine at room temperature-- molecular iodine, that is. And I don't know if you can see with the room lights on. Maybe you can see the streak in the middle of the tube, which is the fluorescence in iodine induced by the dye laser at this particular wavelength.

Now, the fluorescence is made up of many wavelengths. But sometimes you get a big contrast in the colors in the fluorescence as compared with the exciting laser light. So in order to show you this, we've done the following. We've taken the output of the dye laser as it passes through the cell. And then we've scattered it by a scatterer over here onto this screen so that when we dim the room lights, we'll be able to see the fluorescence over here, the iodine fluorescence inside the tube. And the background will be the color of the exciting dye laser light.

So in this way-- and again, if you've set your monitors or your TVs, if you adjusted the settings so that you can see the actual colors, we'll be able to show you on the tape. So now we're going to dim the room lights and then tune the dye lasers and see the fluorescence that can be excited in molecular iodine as a function of dye laser tuning.

Here we are. Now we see that the fluorescence is orange. And the dye laser is yellowish-green. Now I'm going to tune the dye laser. Now you can see that the fluorescence gets fainter. Now here we are. That's one color fluorescence. Now it becomes orange.

Now it's very strong. The fluorescence now is very strong. Now I tuned some more. Sometimes you see it flickering. It's because the laser wavelength is not stabilized. And you're moving away from the absorption lines in iodine. Now here we are. We have very bright fluorescent, very intense fluorescence. And it looks orange-ish. But really, it's not a pure color. It's made up of many wavelengths in the fluorescence. And this depends, again, which states are being excited.

And here we are. This is weak absorption. Again, now, a very faint absorption here. Now the light from the dye laser is yellow. You can see there's absolutely no-- very little absorption over here. And now the fluorescence is almost the same, looks the same color as the dye laser light. Now we have intense fluorescence.

And let me go through and see what we can see. Oh, this one now-- now its fluorescence is yellowish, while over here the fluorescence was more orange-ish. I said before, these are a mixture of-- fluorescence is made up of mixture of wavelengths. They're not pure wavelengths.

Here we are. That's nice. Now you see a nice contrast. Now here's a nice contrast where fluorescence is orange and the laser light is green. And here we are. That's at the end of the spectrum.