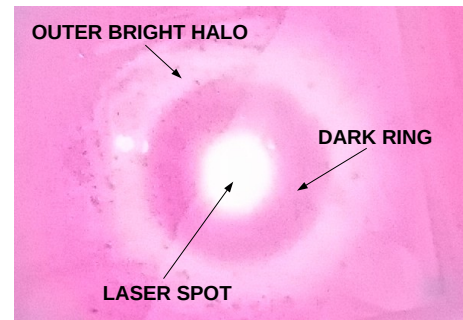


An intriguing dark ring

The goal of this exercise is to provide an explanation to the dark ring-shaped region surrounding the laser spot that is visible on the frosted surface of an otherwise transparent plexiglass slab illuminated by a laser beam.



Picture of the laser spot surrounded by a dark ring-shaped region and, further away, by another luminous halo.

In order to identify the physical effect responsible for this peculiar feature, a possible (but not mandatory) series of questions to be asked to experiments could be the following:

1. How does the pattern change when one changes the incidence angle of the laser light?
2. How does the pattern change when one changes the wavelength of the laser light?
3. What changes if the slab is (partially) immersed in water? How does the pattern depend on the depth of the water layer? How does it depend on whether the frosted/non-frosted surfaces are immersed in water or not?

Find an analytical expression relating the radius of the dark region as a function of the parameters of the system, namely the thickness and the refractive index of the slab, the wavelength of light, the depth of the water layer, etc. and try to verify it with experimental measurements of the different quantities using home-made instruments.