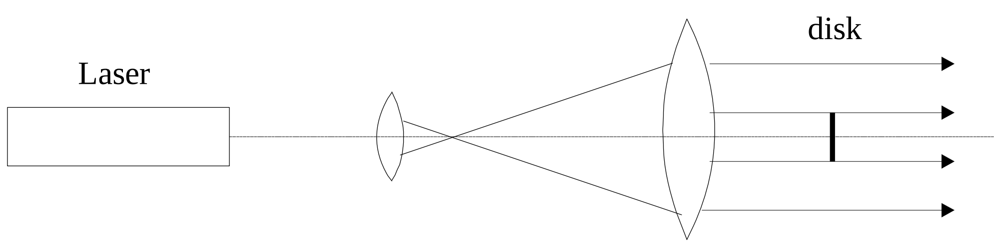
DIFFRACTION.

Poisson's spot.

If a beam is obstructed by a disk, a bright spot at the optical axis, behind and in the geometrical shadow of the disk will be visible. This spot is caused by the edge waves originating from the edge of the disk and which produce constructive interference at the optical axis. Here we demonstrate the Poisson's spot when a laser beam is diffracted by a disk.



$size \equiv 10 \cdot mm$ $\qquad nm \equiv 10^{-9} \cdot m$ $\qquad \lambda \equiv 632.8\,nm$ $\qquad N \equiv 250$

The radius of the disk: $a := 1mm$

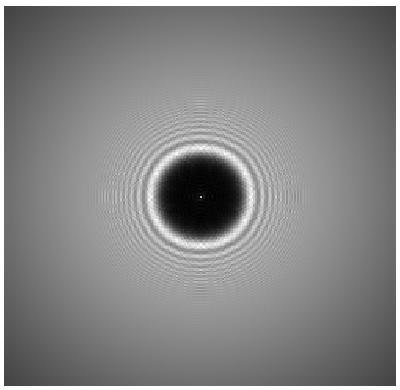
The disk is illuminated with a Gaussian beam from a HeNe laser:

$$F := LPBegin\left(\frac{size}{m}, \frac{\lambda}{m}, N\right) \qquad F := LPGaussHermite\left(0, 0, 1, \frac{size}{1m}, F\right)$$

$F := LPCircScreen\left(\frac{a}{m}, 0, 0, F\right)$ $\quad i := 0 .. 8$ $\quad z_i := 20cm + i \cdot 20cm$

$F1_i := LPForvard\left(\frac{z_i}{m}, F\right)$ $\quad I_i := LPIntensity\left(2, F1_i\right)$

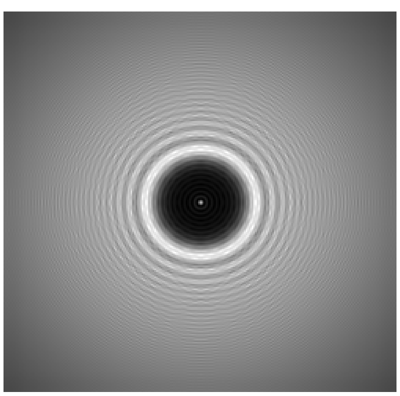
$z_0 = 20\,cm$



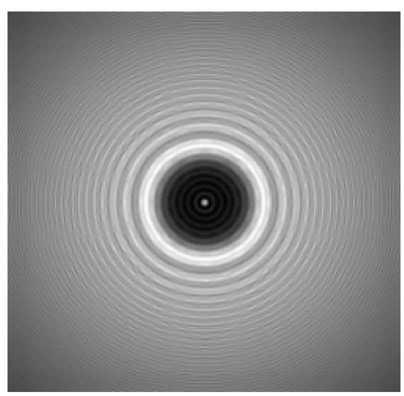
I_0

The bright spot in the geometrical shadow behind the disk, predicted by Poisson using Fresnel's diffraction theory and demonstrated by Arago.

$z_1 = 40\,cm$ $\quad z_2 = 60\,cm$

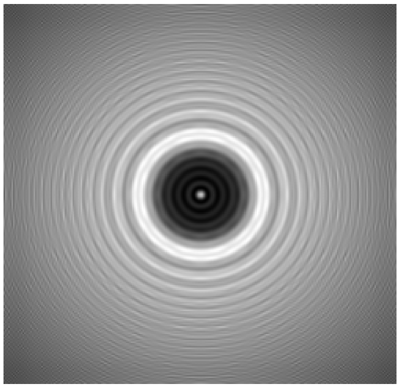


I_1



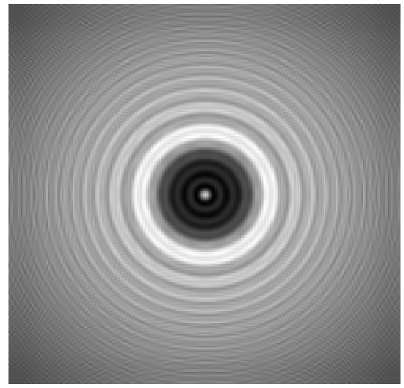
I_2

$z_3 = 80\,\text{cm}$



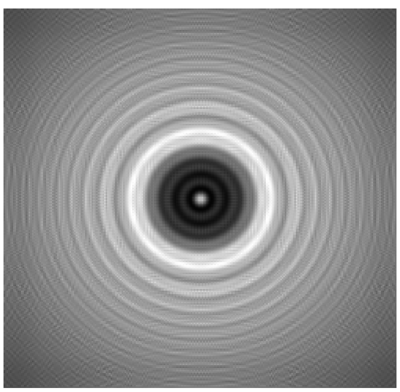
I_3

$z_4 = 100\,\text{cm}$



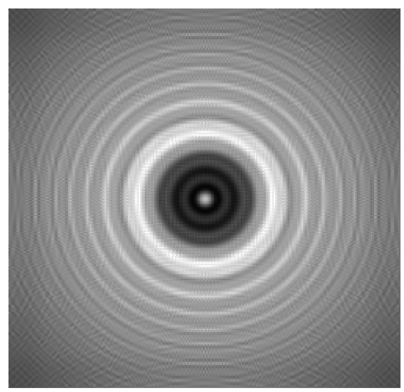
I_4

$z_5 = 120\,\text{cm}$



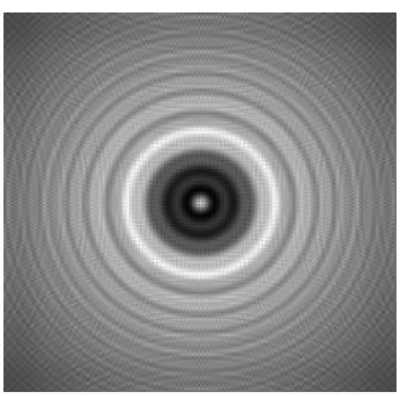
I_5

$z_6 = 140\,\text{cm}$



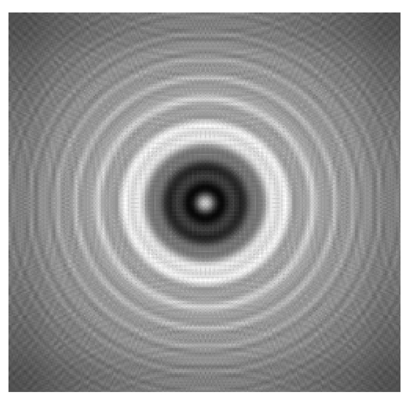
I_6

$z_7 = 160\,\text{cm}$



I_7

$z_8 = 180\,\text{cm}$



I_8