For a perfectly ideal lens

Let us focus our attention to the diffraction limited PSF for a theoretically perfect (or ideal) lens. The encircled energy (or power within a circle) of a diffraction limited PSF is given by the expression,

$$P(r,\lambda) = P_0 \cdot \left(1 - \left[J_1\left(\frac{\pi}{\lambda F_\#} r\right)\right]^2 - \left[J_0\left(\frac{\pi}{\lambda F_\#} r\right)\right]^2\right)$$

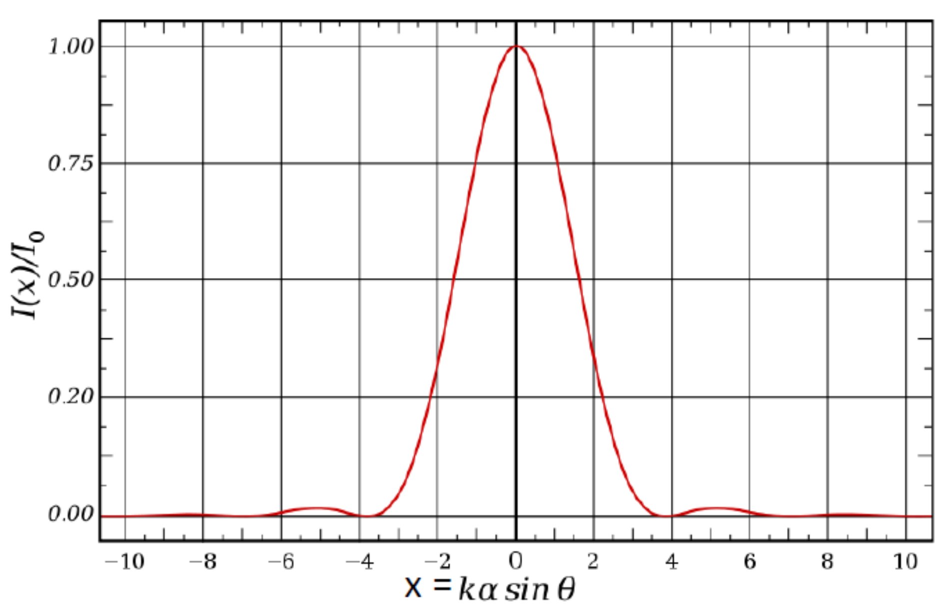
where $P0$ is the input power on the lens, A is the area of the lens, λ is the wavelength, $F_\#$ is the F-number, J_0 and J_1 are the Bessel function of order 0 and 1, respectively, and r is the distance to the center of the image (or the radius of the circle). Now if we take the focusing efficiency to be defined as "the power within a spot of diameter equal to 3 times the FWHM divided by the total power incident on the lens". The FWHM of a diffraction limited PSF occurs at

$$\mathrm{FWHM} \approx 3.23266 \cdot \frac{\lambda F_\#}{\pi}$$

which in turn gives the focusing efficiency

$$\frac{1}{P_0} \cdot P\left(\frac{3}{2}\mathrm{FWHM}, \lambda\right)\% \approx 85\%.$$

An ideal lens produces the Airy disk.



This is the encircled power of the Airy spot.