

Abbe Limit
(Ernest Abbe; 1840-1905)

(Definition) Exact spacing in the specimen can be resolved when the numerical aperture of the objective lens is large enough to capture the first order diffraction pattern produced in a diffraction-limited microscope at a specific wavelength.

$$\text{Abbe limit (d)} = \lambda / 2 \times \text{NA}_{\text{obj}}$$

Where, d = lateral resolution,

λ = wavelength,

NA_{obj} = numerical aperture of objective.

(Note)

$$\text{N.A.} = n \times \sin \frac{1}{2} \text{A. A.}$$

Where, n (“smallest” refractive index in the optical path)

A. A. (“angular aperture” of a cone of light entering the lens)