

## Microscopy Calculator

Objective_Mag := 20	Enter the Objective Magnification
Objective_NA := 0.80	Enter the Objective Numerical Aperture
Medium_Index := 1.000	Enter the medium's refractive index (air = 1.000, water = 1.333, oil = 1.515)
Objective_Field_Number := 22·mm	Enter the well corrected Objective Field Diameter
Wavelength := 550·nm	Enter wavelength of light; yellow-green = 550 nm
Camera_Pixel_Size := 2.40·μm	Enter the size of the camera sensor's pixels (assumed to be square)
Camera_Pixels_in_Width := 5496	Enter the number of pixels in width
Camera_Pixels_in_Height := 3672	Enter the number of pixels in height

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Camera_Sensor_Width := Camera_Pixel_Size·Camera_Pixels_in_Width	Camera_Sensor_Width = 13.19·mm
Camera_Sensor_Height := Camera_Pixel_Size·Camera_Pixels_in_Height	Camera_Sensor_Height = 8.81·mm
Sensor_Diagonal := $\sqrt{\text{Camera\_Sensor\_Width}^2 + \text{Camera\_Sensor\_Height}^2}$	Sensor_Diagonal = 15.86·mm
Unity_Tube_Lens_FOV := $\frac{\text{Sensor\_Diagonal}}{\text{Objective\_Mag}}$	Unity_Tube_Lens_FOV = 0.79·mm
Maximum_FOV_Diagonal := $\frac{\text{Objective\_Field\_Number}}{\text{Objective\_Mag}}$	Maximum_FOV_Diagonal = 1.10·mm
Optimum_Total_Mag := $\frac{\text{Sensor\_Diagonal}}{\text{Maximum\_FOV\_Diagonal}}$	Optimum_Total_Mag = 14.42
Tube_Lens_Mag := $\frac{\text{Optimum\_Total\_Mag}}{\text{Objective\_Mag}}$	Tube_Lens_Mag = 0.72
Field_of_View_Width := $\frac{\text{Camera\_Sensor\_Width}}{\text{Optimum\_Total\_Mag}}$	Field_of_View_Width = 914.64·μm
Field_of_View_Height := $\frac{\text{Camera\_Sensor\_Height}}{\text{Optimum\_Total\_Mag}}$	Field_of_View_Height = 611.09·μm
FOV_Area := Field_of_View_Width·Field_of_View_Height	FOV_Area = 0.56·mm <sup>2</sup>
Pixel_Resolution := $\frac{\text{Camera\_Pixel\_Size}}{\text{Optimum\_Total\_Mag}}$	Pixel_Resolution = 0.17·μm
Diffraction_Resolution := $1.22 \frac{\text{Wavelength}}{2 \cdot \text{Objective\_NA}}$	Diffraction_Resolution = 0.42·μm

$$\text{Oversampling} := \frac{\text{Diffraction\_Resolution}}{\text{Pixel\_Resolution}}$$

$$\text{Oversampling} = 2.52$$

$$\text{Depth\_of\_Field\_Half} := \frac{\text{Wavelength} \cdot \sqrt{\text{Medium\_Index}^2 - \text{Objective\_NA}^2}}{2 \cdot \text{Objective\_NA}^2}$$

$$\text{Depth\_of\_Field\_Half} = 0.26 \cdot \mu\text{m} \quad [+ / -]$$

$$\text{Depth\_of\_Focus} := \text{Depth\_of\_Field\_Half} \cdot \text{Optimum\_Total\_Mag}^2 \cdot 2$$

$$\text{Depth\_of\_Focus} = 107.24 \cdot \mu\text{m}$$

$$\text{Allowable\_Tilt\_mrad\_Half} := \frac{\text{Depth\_of\_Field\_Half}}{\text{Maximum\_FOV\_Diagonal}} \cdot 1000$$

$$\text{Allowable\_Tilt\_mrad\_Half} = 0.23 \quad [+ / -]$$

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