

(*ref: Murphy, Fundamentals of light microscopy, p319*)

$\mu\text{m} = 10^{-6}$;

$\text{nm} = 10^{-9}$;

(*Diffraction limit. These eqs. are valid for $\text{NA} > 0.7$ *)

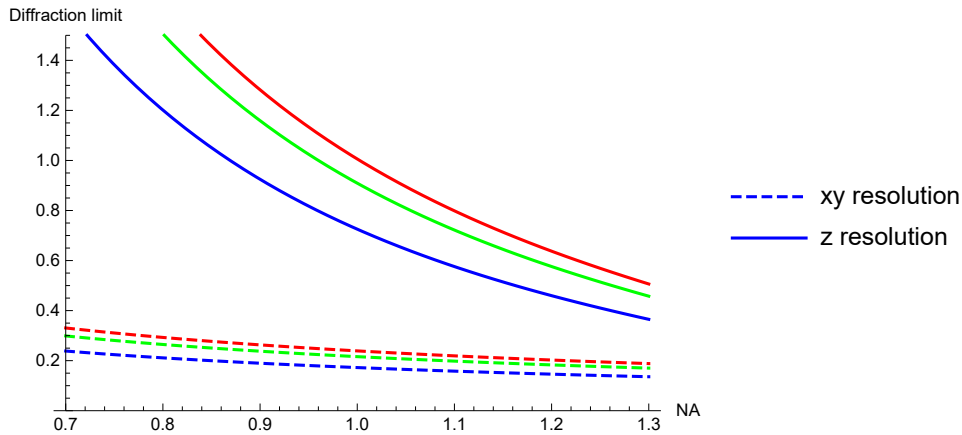
$$\text{resXY}[\lambda_, \text{NA}_] := 0.325 \frac{\lambda}{\sqrt{2} \text{NA}^{0.91}}$$

$$\text{resZ}[\lambda_, \text{RI}_, \text{NA}_] := 0.532 \frac{\lambda}{\sqrt{2}} \frac{1}{\text{RI} - \sqrt{\text{RI}^2 - \text{NA}^2}}$$

(*Resolution vs NA*)

$\text{RI} = 1.48$;

Plot[Evaluate[Table[{resXY[λ nm, NA], resZ[λ nm, RI, NA]} / μm , { λ , {750, 940, 1040}}]],
 {NA, 0.7, 1.3}, PlotRange \rightarrow {0, 1.5}, AxesLabel \rightarrow {"NA", "Diffraction limit"},
 PlotStyle \rightarrow {{Dashed, Blue}, Blue, {Dashed, Green}, Green, {Dashed, Red}, Red},
 PlotLegends \rightarrow {"xy resolution", "z resolution"}]



(*Resolution vs RI*)

$\text{NA} = 1.3$;

$\lambda = 750 \text{ nm}$;

Plot[{resXY[λ , NA] / μm , resZ[λ , RI, NA] / μm }, {RI, 1.41, 1.52}, PlotRange \rightarrow {0, 1},
 PlotStyle \rightarrow {{Dashed, Gray}, {Thick, Gray}}, AxesLabel \rightarrow {"RI", "Diffraction limit"}]

