hhmi janelia Research Campus	ZEISS CONFOCAL OBJECTIVES	v05
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Typical objectives installed on Zeiss fluorescence microscopes. For a list of all objectives available, please visit: https://www.janelia.org/support-team/light-microscopy/resources

					r_{xy} = Lateral Resolution (µm)			r_z = Axial Resolution (µm)		
Objectives	Magnification	*N.A.*	Immersion Type	Working Distance (mm)	Conventional	Confocal (*PH<0.25AU*)	Confocal (*PH>1AU*)	Conventional	Confocal (*PH<0.25AU*)	Confocal (*PH>1AU*)
Plan-Apochromat 5x/0.16 M27 420630-9900	5x	0.16	Air	12.1	*1.94*	*1.15*	*1.56*	*39.77*	*24.92*	*33.74*
EC Plan-Neofluar 10x/0.3 M27 420340-9901	10x	0.3	Air	5.2	*1.03*	*0.61*	*0.83*	*11.31*	*7.09*	*9.60*
Plan-Apochromat 10x/0.45 M27 420640-9900/9901	10x	0.45	Air	2	*0.69*	*0.41*	*0.55*	*5.03*	*3.15*	*4.27*
Plan-Apochromat 20x/0.8 M27 420650-9901	20x	0.8	Air	0.55	*0.39*	*0.23*	*0.31*	*1.59*	*0.80*	*1.07*
W Plan-Apochromat 20x/1.0 DIC M27 75mm 421452-9800	20x	1	Water-dipping	1.8	*0.31*	*0.18*	*0.25*	*1.35*	*0.70*	*0.95*
LD LCI Plan-Apochromat 25x/0.8 Imm Corr DIC M27 420852-9870/9871	25x	0.8	Water, Gly, Oil	0.57 @#1.5	*0.39*	*0.23*	*0.31*	*2.12, 2.34, 2.41*	*1.19, 1.35, 1.40*	*1.61, 1.82, 1.88*
EC Plan-Neofluar 40x/1.30 Oil DIC M27 420462-9900	40x	1.3	Oil	0.21	*0.24*	*0.14*	*0.19*	*0.91*	*0.43*	*0.58*
Plan-Apochromat 40x/0.95 Corr M27 420661-9970	40x	0.95	Air	0.25	*0.33*	*0.19*	*0.26*	*1.13*	*0.46*	*0.62*
Plan-Apochromat 40x/1.3 Oil DIC M27 420762-9800-799	40x	1.3	Oil	0.21	*0.24*	*0.14*	*0.19*	*0.91*	*0.43*	*0.58*
W Plan-Apochromat 40x/1.0 DIC M27 421462-9900	40x	1	Water-dipping	2.5	*0.31*	*0.18*	*0.25*	*1.35*	*0.70*	*0.95*
C-Apochromat 40x/1.2 W Corr M27 421767-9970/9971	40x	1.2	Water	0.28 @#1.5	*0.26*	*0.15*	*0.21*	*0.94*	*0.42*	*0.57*
Plan-Apochromat 63x/1.4 Oil DIC M27 420782-9900/9900-799	63x	1.4	Oil	0.19	*0.22*	*0.13*	*0.18*	*0.79*	*0.34*	*0.46*
Plan-Apochromat 100x/1.40 Oil DIC M27 420792-9900	100x	1.4	Oil	0.17	*0.22*	*0.13*	*0.18*	*0.79*	*0.34*	*0.46*

N.A. = Numerical Aperture
PH = Pinhole Diameter
n = Refractive Index
λ_{exc} = Excitation Wavelength (488 nm)
λ_{em} = Emission Wavelength (510 nm)
$\bar{\lambda} = \sqrt{\lambda_{exc}\lambda_{em}}$

$$r_{xy} = \frac{0.61\lambda_{em}}{NA}$$

$$r_z = \frac{2n\lambda_{em}}{NA^2}$$

$$r_{xy}(PH < 0.25AU) = \frac{0.37\bar{\lambda}}{NA}$$

$$r_z(PH < 0.25AU) = \begin{cases} for\ NA \geq 0.5 & \frac{0.64\bar{\lambda}}{n - \sqrt{n^2 - NA^2}} \\ for\ NA < 0.5 & \frac{1.28n\bar{\lambda}}{NA^2} \end{cases}$$

$$r_{xy}(PH > 1AU) = \frac{0.51\lambda_{exc}}{NA}$$

$$r_z(PH > 1AU) = \begin{cases} for\ NA \geq 0.5 & \frac{0.88\lambda_{exc}}{n - \sqrt{n^2 - NA^2}} \\ for\ NA < 0.5 & \frac{1.77n\lambda_{exc}}{NA^2} \end{cases}$$

$$Recommended\ pixel\ size = r_{xy}/2.3$$

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