

PSF40x

Microscope info:

Image		2026-06-15 40xResolution				
image's creation	date	2026-06-17 12:51:43				
	method used	from file creation date				
Actual image depth		16				
Microscope type		WideField				
Objective	NA	1.4				
	im. refractive index	1.518				
Channel(s)		Wavelengths		Saturation	sampling (X,Y,Z)	
		Ex. (nm)	Em. (nm)		Nyquist (μm)	Nyquist/found ratio
Channel 0			410.0	none	0.073x0.073x0.22	2.2, 2.2, 1.4
Channel 1			450.0	none	0.08x0.08x0.24	2.0, 2.0, 1.2
Channel 2			525.0	none	0.094x0.094x0.282	1.7, 1.7, 1.1
Channel 3			570.0	none	0.102x0.102x0.306	1.6, 1.6, 1.0

Warnings:

(No saturated pixels detected). The highlighted undersampled channels may alter the result interpretation. (A subresolution bead is used for all channels).

Resolution table:

Channel	Sig/Backgnd ratio	Dimension	Measured FWHM (μm)	theory (μm)	Fit Goodness	Mes./theory ratio
Channel 0 (em. 410.0nm)	2.5	X	0.852	0.149	0.72	5.7
		Y	0.691	0.149	0.73	4.63
		Z	1.738	0.562	0.92	3.09
Channel 1 (em. 450.0nm)	1.3	X	0.085	0.164	0.02	0.52
		Y	11.827	0.164	0.05	72.15
		Z	0.374	0.617	0.3	0.61
Channel 2 (em. 525.0nm)	2.5	X	1.055	0.191	0.08	5.52
		Y	10.643	0.191	0.19	55.65
		Z	5.512	0.72	0.42	7.66
Channel 3 (em. 570.0nm)	2.8	X	5.666	0.208	0.16	27.29
		Y	2.036	0.208	0.12	9.81
		Z	0.602	0.781	0.03	0.77

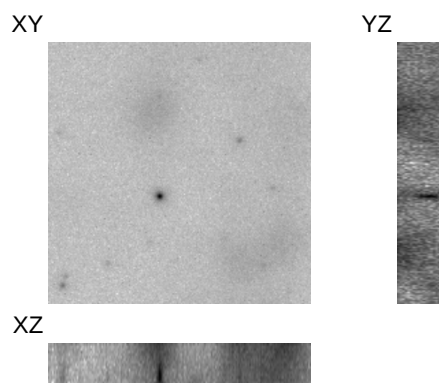
Green: within specifications, red: outside specifications (ie. XY ratios above 1.5 or Z ratio above 2.0)

Lateral asymmetry ratios:

Channel	Ratio
Channel 0 (em. 410.0nm)	0.81
Channel 1 (em. 450.0nm)	0.01
Channel 2 (em. 525.0nm)	0.1
Channel 3 (em. 570.0nm)	0.36

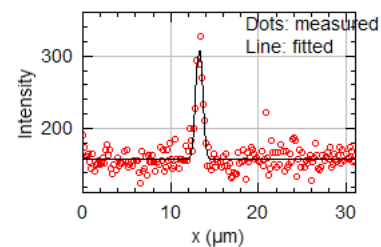
Detailed channel detection info:

Channel #0

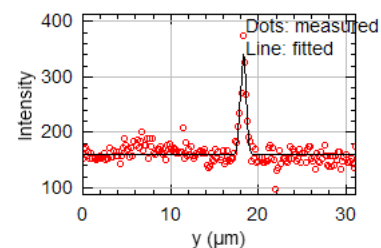


Channel 0 (em. 410.0nm)				
Sig./Backgnd ratio	LAR	Dimension	FWHM	Fit goodness
2.5	0.81	X	0.852	0.72
		Y	0.691	0.73
		Z	1.738	0.92

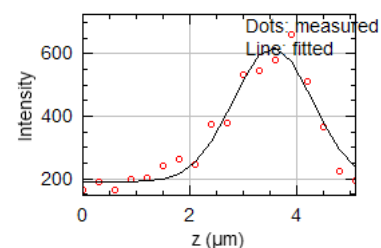
X profile & fitting parameters:
Fit equation $I(x) = a + (b-a) \cdot \exp(-(x-c)/(2 \cdot d))$
Sum of residuals squared: 33500.6993
Standard deviation: 13.24373
 R^2 : 0.72299
Parameters:
a = 158.05064
b = 310.06703
c = 13.24704
d = 0.36175



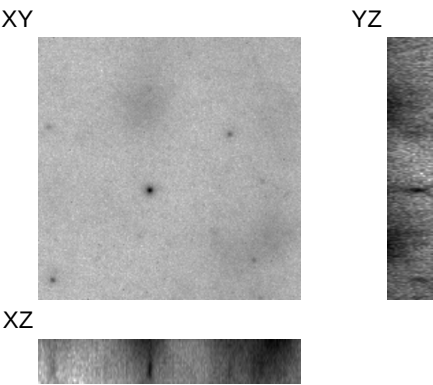
Y profile & fitting parameters:
Fit equation $I(y) = a + (b-a) \cdot \exp(-(y-c)/(2 \cdot d))$
Sum of residuals squared: 37866.4188
Standard deviation: 14.08025
 R^2 : 0.73538
Parameters:
a = 160.16142
b = 344.53750
c = 18.25379
d = 0.29360



Z profile & fitting parameters:
Fit equation $I(z) = a + (b-a) \cdot \exp(-(z-c)/(2 \cdot d))$
Sum of residuals squared: 28746.1510
Standard deviation: 41.12116
 R^2 : 0.93669
Parameters:
a = 190.28029
b = 621.43547
c = 3.55116
d = 0.73798

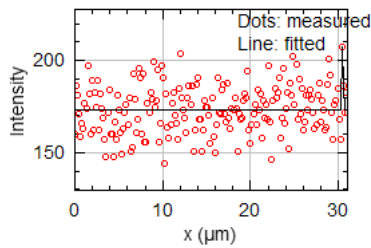


Channel #1

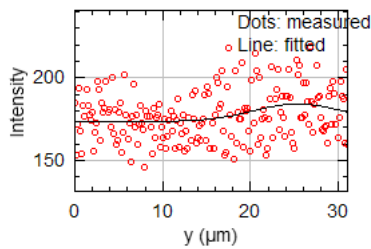


Channel 1 (em. 450.0nm)				
Sig./Backgnd ratio	LAR	Dimension	FWHM	Fit goodness
1.3	0.01	X	0.085	0.02
		Y	11.827	0.05
		Z	0.374	0.3

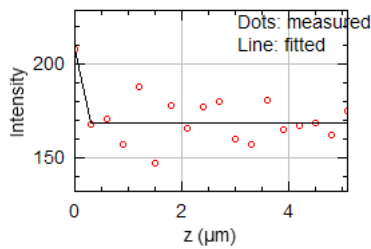
X profile & fitting parameters:
Fit equation $I(x) = a + (b-a) \cdot \exp(-(x-c)/(2 \cdot d))$
Sum of residuals squared: 30456.7632
Standard deviation: 12.62773
 R^2 : 0.04039
Parameters:
 $a = 173.34211$
 $b = 441.49483$
 $c = 30.46093$
 $d = 0.036043$



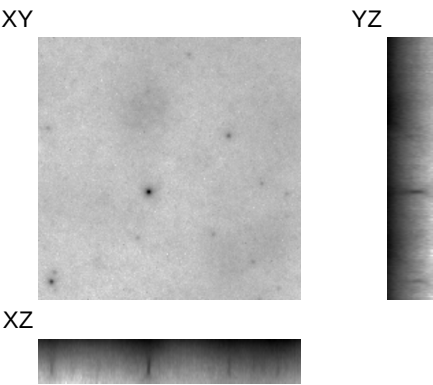
Y profile & fitting parameters:
Fit equation $I(y) = a + (b-a) \cdot \exp(-(y-c)/(2 \cdot d))$
Sum of residuals squared: 41684.7749
Standard deviation: 14.77311
 R^2 : 0.07065
Parameters:
 $a = 173.69657$
 $b = 184.33421$
 $c = 25.33706$
 $d = 5.02240$



Z profile & fitting parameters:
Fit equation $I(z) = a + (b-a) \cdot \exp(-(z-c)/(2 \cdot d))$
Sum of residuals squared: 1741.52941
Standard deviation: 10.12141
 R^2 : 0.45573
Parameters:
 $a = 168.70588$
 $b = 7.37080E151$
 $c = -4.18055$
 $d = 0.15892$

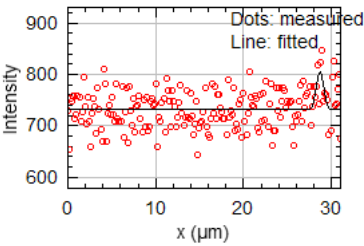


Channel #2

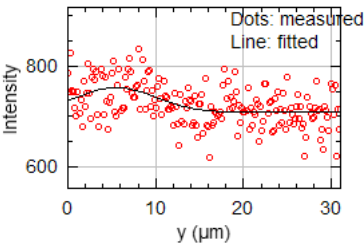


Channel 2 (em. 525.0nm)				
Sig./Backgnd ratio	LAR	Dimension	FWHM	Fit goodness
2.5	0.1	X	1.055	0.08
		Y	10.643	0.19
		Z	5.512	0.42

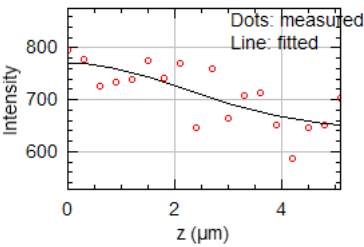
X profile & fitting parameters:
Fit equation $I(x) = a + (b-a) \cdot \exp(-(x-c)/(2 \cdot d))$
Sum of residuals squared: 239454.383
Standard deviation: 35.40745
 R^2 : 0.09629
Parameters:
 $a = 731.28821$
 $b = 805.44414$
 $c = 28.69112$
 $d = 0.44818$



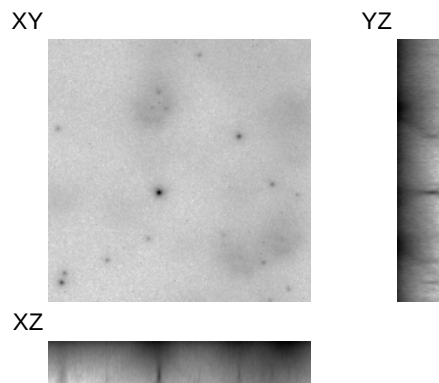
Y profile & fitting parameters:
Fit equation $I(y) = a + (b-a) \cdot \exp(-(y-c)/(2 \cdot d))$
Sum of residuals squared: 247566.855
Standard deviation: 36.00224
 R^2 : 0.20789
Parameters:
 $a = 708.51348$
 $b = 757.40887$
 $c = 5.51484$
 $d = 4.51980$



Z profile & fitting parameters:
Fit equation $I(z) = a + (b-a) \cdot \exp(-(z-c)/(2 \cdot d))$
Sum of residuals squared: 26128.7180
Standard deviation: 39.20438
 R^2 : 0.54835
Parameters:
 $a = 638.95959$
 $b = 771.10033$
 $c = -0.10988$
 $d = 2.34052$

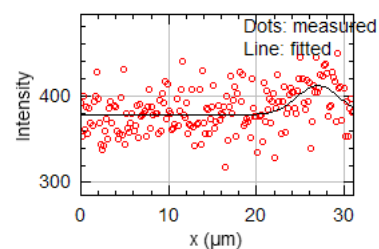


Channel #3

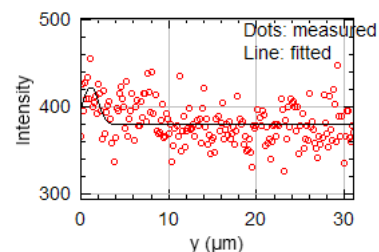


Channel 3 (em. 570.0nm)				
Sig./Backgnd ratio	LAR	Dimension	FWHM	Fit goodness
2.8	0.36	X	5.666	0.16
		Y	2.036	0.12
		Z	0.602	0.03

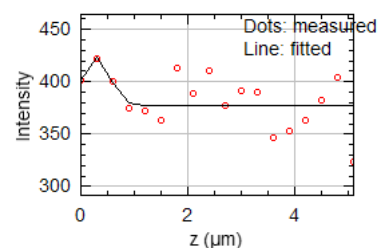
X profile & fitting parameters:
Fit equation $I(x) = a + (b-a) \cdot \exp(-(x-c)/(2 \cdot d))$
Sum of residuals squared: 98743.0913
Standard deviation: 22.73718
 R^2 : 0.18118
Parameters:
 $a = 378.21752$
 $b = 411.71450$
 $c = 26.97936$
 $d = 2.40615$



Y profile & fitting parameters:
Fit equation $I(y) = a + (b-a) \cdot \exp(-(y-c)/(2 \cdot d))$
Sum of residuals squared: 93548.3042
Standard deviation: 22.13101
 R^2 : 0.13610
Parameters:
 $a = 380.21987$
 $b = 422.06118$
 $c = 1.11474$
 $d = 0.86473$



Z profile & fitting parameters:
Fit equation $I(z) = a + (b-a) \cdot \exp(-(z-c)/(2 \cdot d))$
Sum of residuals squared: 8373.74317
Standard deviation: 22.19399
 R^2 : 0.24377
Parameters:
 $a = 376.78145$
 $b = 422.86467$
 $c = 0.28536$
 $d = 0.25572$



Analysis parameters

Tool & Operator	Tool	PSF Profiler
	Versions	MetroloJ_QC v1.3.1.2, ImageJ v2.16.0/1.54p, Java v1.8.0_452, OS Windows 11
	Operator & date	Hanna, June 17, 2026 12:59 PM
data	result folder	Z:\CTIU\QC\2026-06-15\Thunder\Processed\PSF40x\
	Type of saved data	.pdf, .jpg, .xls
	Input data bit depth	16
Dimension order		XY-(C)Z
Discard saturated samples		false
Beads	Bead detection threshold	Legacy
	Center detection method	Legacy Fit Ellipses
	Discard bead if more than one particle are thresholded	false
	Background annulus thickness in μm	1.0
	Background annulus distance to bead edges in μm	0.5
	Multiple beads in image	false
Square Root PSF Image displayed		true
Tolerance	Applied in this report	true
	X & Y FWHM ratios valid if below	1.5
	Z FWHM ratio valid if below	2.0

Analysis log

image name	creation date	saturation	sampling density	status
2026-06-15_40xResolution	2026-06-17 12:51:43	none	Ch.0,1,2,3 undersampled	analysed

Formulas used:

Lateral ($res_{x,y}^o$) and axial (res_z^o) theoretical resolution values used for widefield microscopes are calculated as defined in Wilhelm, S. Confocal Laser Scanning Microscopy, 2011:

$$res_{x,y}^o = \frac{0.51 \cdot \lambda_{em}}{NA} \quad res_z^o = \frac{1.77 n \cdot \lambda_{em}}{NA^2}$$

NA: numerical aperture, λ_{em} : emission wavelength, n: refractive index of the lens immersion & mounting media.

Axis profiles are fitted using ImageJ Gaussian Curve Fitter and the following formula $y = a + (b - a) * e^{\frac{-(x-c)^2}{2d^2}}$ (Gaussian fitting).

Measured lateral and axial resolution (Full Width at Half Maximum, FWHM) values are derived using $FWHM = 2d\sqrt{2\ln(2)}$

Compliance with the Shannon-Nyquist criterion uses the following formulas for Shannon-Nyquist distances calculation:

$$\alpha = \arcsin\left(\frac{NA}{n}\right)$$

$$\Delta_{x,y} = \frac{\lambda_{em}}{4 \cdot NA} \quad \Delta_z = \frac{\lambda_{em}}{2 \cdot n \cdot (1 - \cos(\alpha))}$$