



OrangeBeadsReport2

Microscope info:

| | | | | | | |
|--------------------------------------|----------------------|-------------------------|----------|------------|-------------------|---------------------|
| Image | | Image4_bead16 | | | | |
| image's creation | date | 2024-10-17 10:22:29 | | | | |
| | 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 | | | 590.0 | none | 0.105x0.105x0.317 | 0.063x0.063x0.06 |
| Bead original coordinates(in pixels) | | 328.0, 115.0 | | | | |

Warnings:

(No saturated pixels detected). (All channels sampled following Shannon-Nyquist criterion). (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. 590.0nm) | 2.6 | X | 0.076 | 0.215 | 0.14 | 0.36 |
| | | Y | 0.436 | 0.215 | 0.1 | 2.03 |
| | | Z | Center detection failed | | | |

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

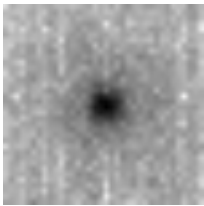
Lateral asymmetry ratios:

| Channel | Ratio |
|-------------------------|-------|
| Channel 0 (em. 590.0nm) | 0.18 |

Detailed channel detection info:

Channel #0

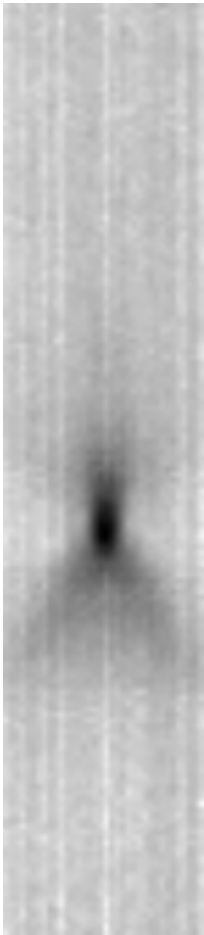
XY



YZ

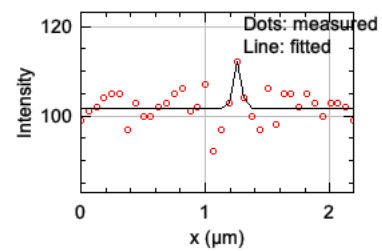


XZ

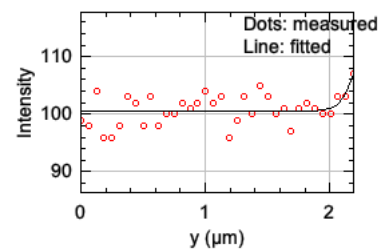


| Channel 0 (em. 590.0nm) | | | | |
|-------------------------|------|-----------|-------------------------|--------------|
| Sig./Backgnd ratio | LAR | Dimension | FWHM | Fit goodness |
| 2.6 | 0.18 | X | 0.076 | 0.14 |
| | | Y | 0.436 | 0.1 |
| | | Z | Center detection failed | |

X profile & fitting parameters:
Fit equation $I(x) = a + (b-a) \cdot \exp(-(x-c)/(2 \cdot d))$
Sum of residuals squared: 345.58973
Standard deviation: 3.14229
R^2: 0.23373
Parameters:
a = 101.78989
b = 112.14908
c = 1.25744
d = 0.032423



Y profile & fitting parameters:
Fit equation $I(y) = a + (b-a) \cdot \exp(-(y-c)/(2 \cdot d))$
Sum of residuals squared: 194.83634
Standard deviation: 2.35940
R^2: 0.19820
Parameters:
a = 100.51930
b = 156.81504
c = 2.57688
d = 0.18498



Analysis parameters

| | | |
|---------------------------------|--|---|
| Tool & Operator | Tool | PSF Profiler (batch) |
| | Versions | MetroloJ_QC v1.3.0, ImageJ v2.14.0/1.54f, Java v1.8.0_322, OS Mac OS X |
| | Operator & date | aaa, October 20, 2024 10:52 AM |
| data | result folder | /Users/bumozaza/Desktop/Zeiss WFM/orange/Processed/OrangeBeadsReport2/Image 4/bead16/ |
| | Type of saved data | .pdf, .jpg, .xls |
| | Input data bit depth | 16 |
| Dimension order | | XY-(C)Z |
| Discard saturated samples | | true |
| Beads | Bead detection threshold | Legacy |
| | Center detection method | Centroid |
| | Discard bead if more than one particle are thresholded | true |
| | Background annulus thickness in μm | 0.5 |
| | Background annulus distance to bead edges in μm | 0.5 |
| | Multiple beads in image | true |
| | Bead identification method | Using Find Maxima (prominence of 1000.0) |
| | Bead size (μm) | 0.1 |
| | Bead crop Factor | 10.0 |
| | Cropped ROI size in μm | 2.31x2.31 (using bead size & background annulus parameters) |
| | Bead rejection distance to top/bottom | 2.0 μm |
| 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 |
|----------------|---------------------|------------|------------------|----------|
| Image 4_bead16 | 2024-10-17 10:22:29 | none | correct | 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:

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

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