

Weekly Report

LIGHT FIELD MICROSCOPY

For all the experiments this two weeks:

Objective: **40X0.85**

MLA: pitch: 150um

focal length: 3500um

Z=0: Original focal plane

Z>0: plane away from objective

Z<0: plane near the objective

Theoretically derived parameters for this system:

R_obj is 11.4569um

Under MLA with pitch@150um the Nu/Nv is 13.0925

The max NA for this objective is **0.85**

D_tot1 is 0.71696um

D_tot2 is **5.4103**um

D_tot3 is **62.1649**um

For comparison

MIT LFDM

40X0.95 150um/3000um

Lateral: **1.4**um

Axial: **2.6**um

Volume: ~350x350x30um

p.s. The procedure to adjust the Iris of Objective 40X1.0 to 40X0.85:

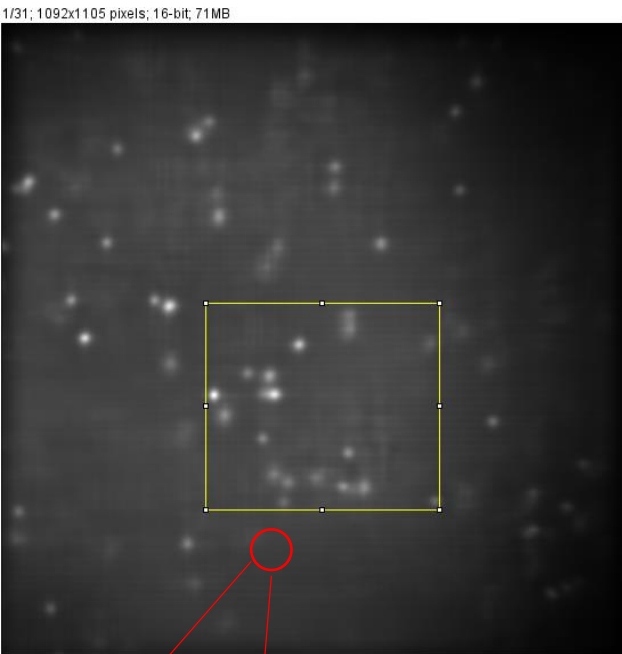
1. Calibrate the system with Objective 20X0.45 and assume it's ideal.(0.43)
2. Turn 40X1.0 on and rotate the Iris to make lenslet's sub-image adjoin each other

LFDM Exp:

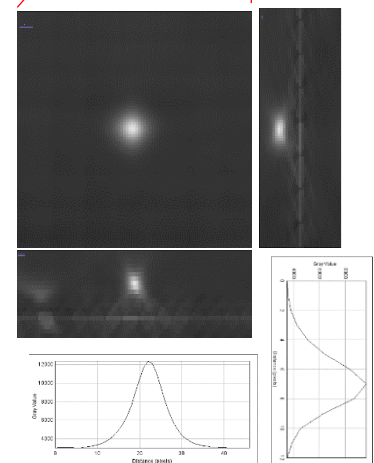
1. Fluorescent Beads imaging
2. C.elegans imaging

Target:

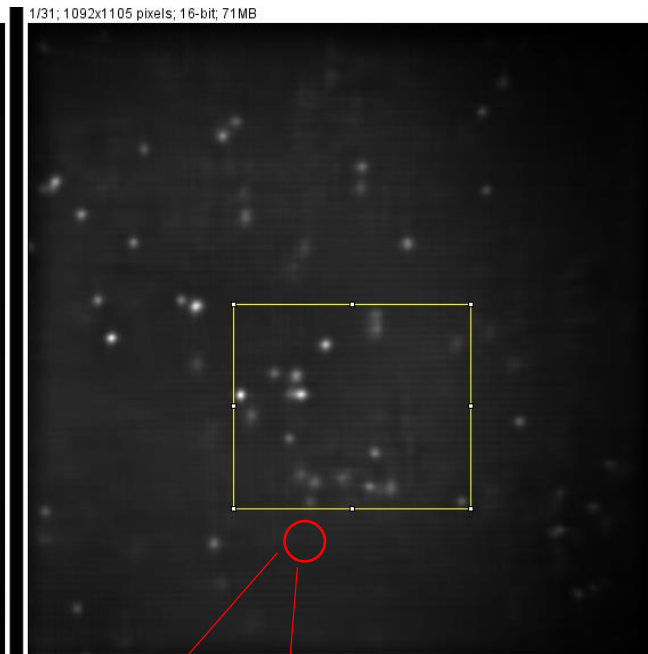
1. Observe the tendency of the quality of reconstruction under the changing parameters
2. System ability test: DOF and Resolution
3. Verified its effectiveness in worms imaging
4. Acquire training dataset



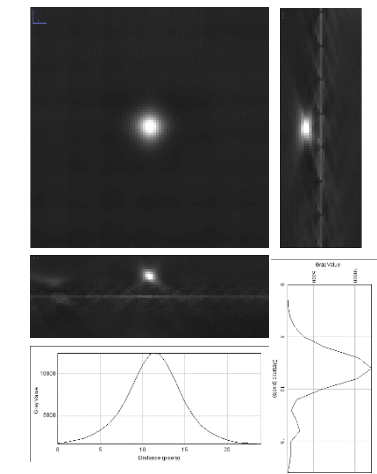
OSR3Iter4
Dynamic Range
2656-12276



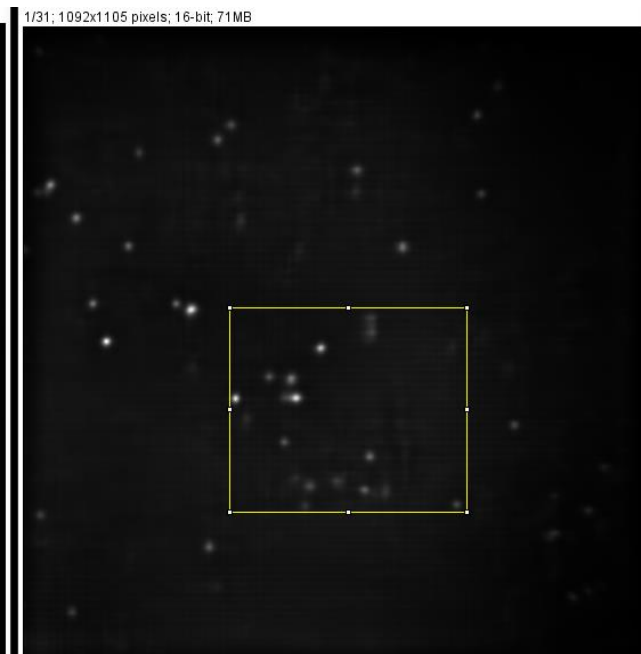
Lateral: 2.26um
Axial: 6.27um



OSR3Iter8
Dynamic Range
1189-11065



Lateral: 1.52um
Axial: 4.67um



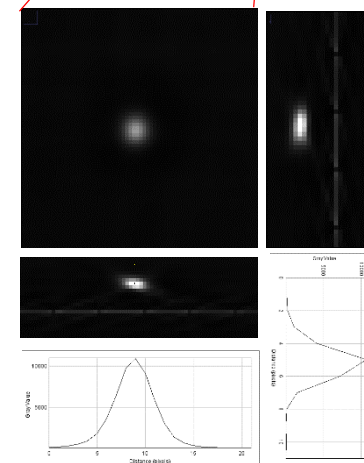
OSR3Iter16
Dynamic Range
508-10065

Same point at $z = -16\mu\text{m}$

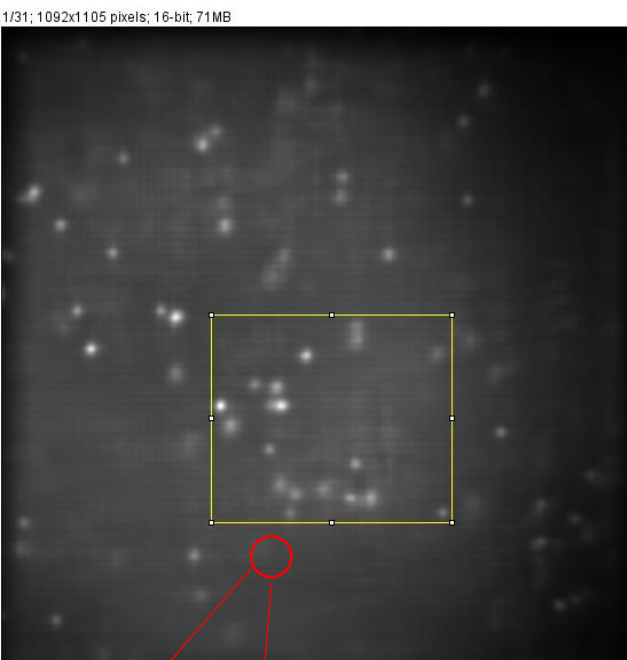
OSR : OverSampling Ratio
Iter: iteration in Lucy-Richardson
deconvolution



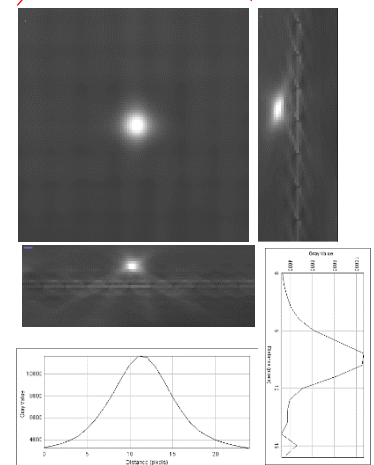
OSR3Iter32
Dynamic Range
132-7324



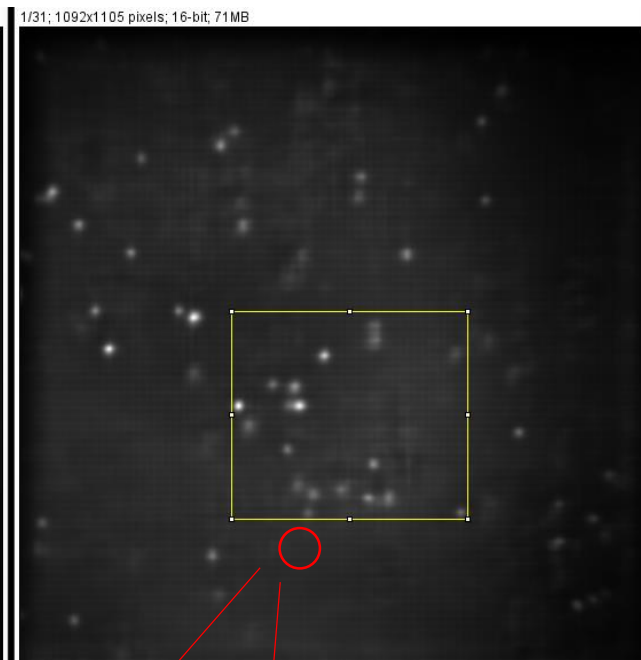
Lateral: 1.45um
Axial: 3.65um



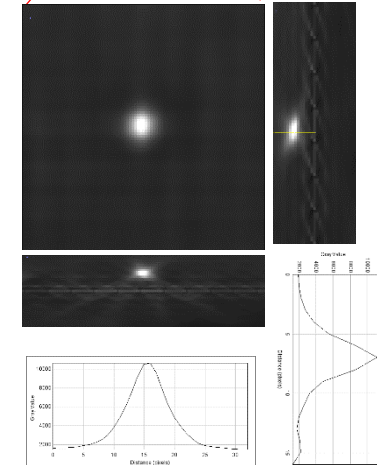
OSR5Iter4
Dynamic Range
2400-10695



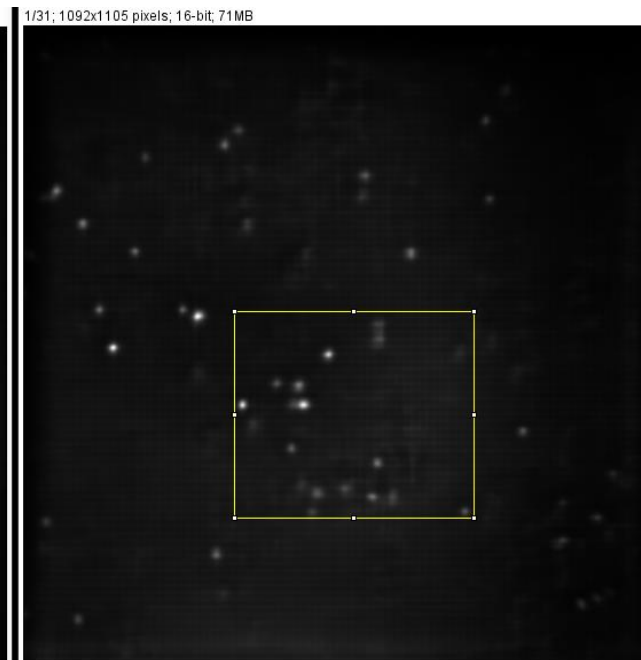
Lateral: 2.22um
Axial: 7.76um



OSR5Iter8
Dynamic Range
1292-9747



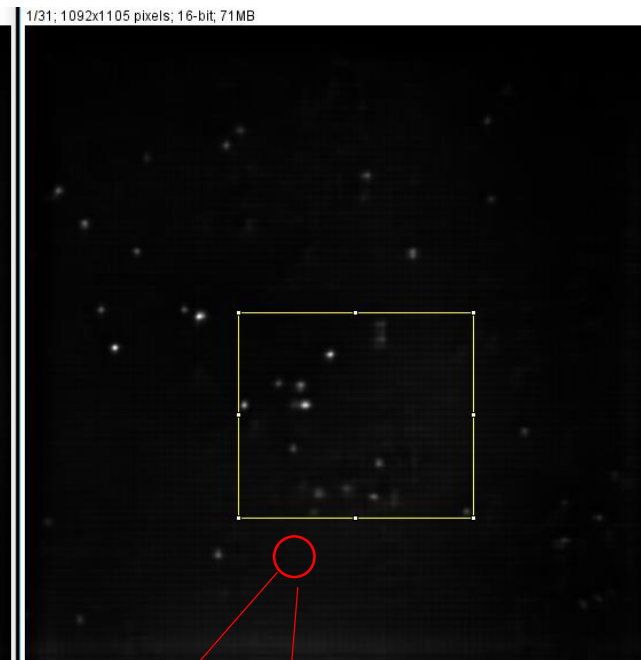
Lateral: 2.02um
Axial: 5.45um



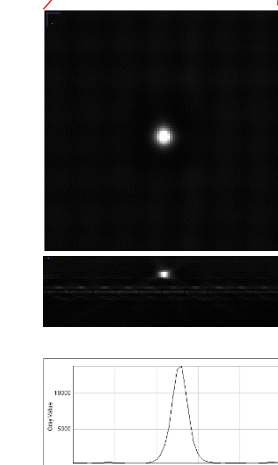
OSR5Iter16
Dynamic Range
373-7420

Same point at $z = -16\mu\text{m}$

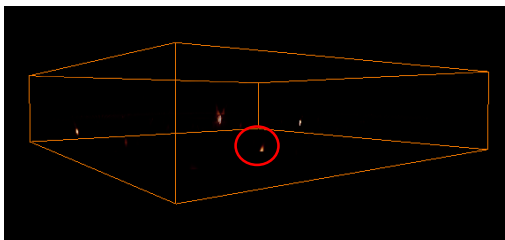
OSR : OverSampling Ratio
Iter: iteration in Lucy-Richardson
deconvolution



OSR5Iter32
Dynamic Range
102-7479



Lateral: 1.03um
Axial: 3.22um



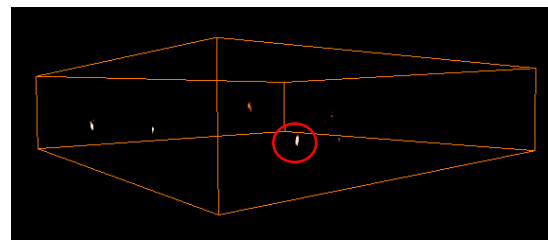
Z = -25um

Lateral: 2.34um Axial: 8um



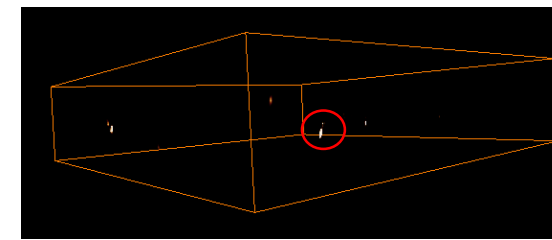
Z = -20um

Lateral: 1.98um Axial: 3.07um



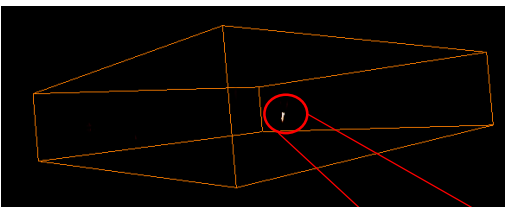
Z = -15um

Lateral: 1.37um Axial: 3.65um



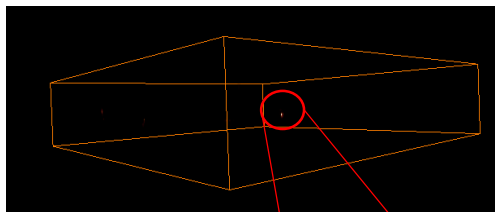
Z = -10um

Lateral: 1.22um Axial: 3.77um



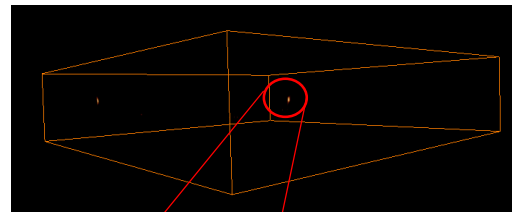
Z = -5um

Lateral: 1.61um Axial: 4.02um



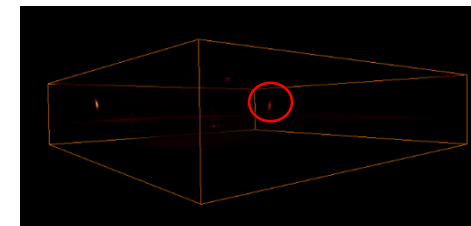
Z = 0

Lateral: 3.54um Axial: 7.50um



Z = 5um

Lateral: 1.84um Axial: 6.58um



Z = 10um

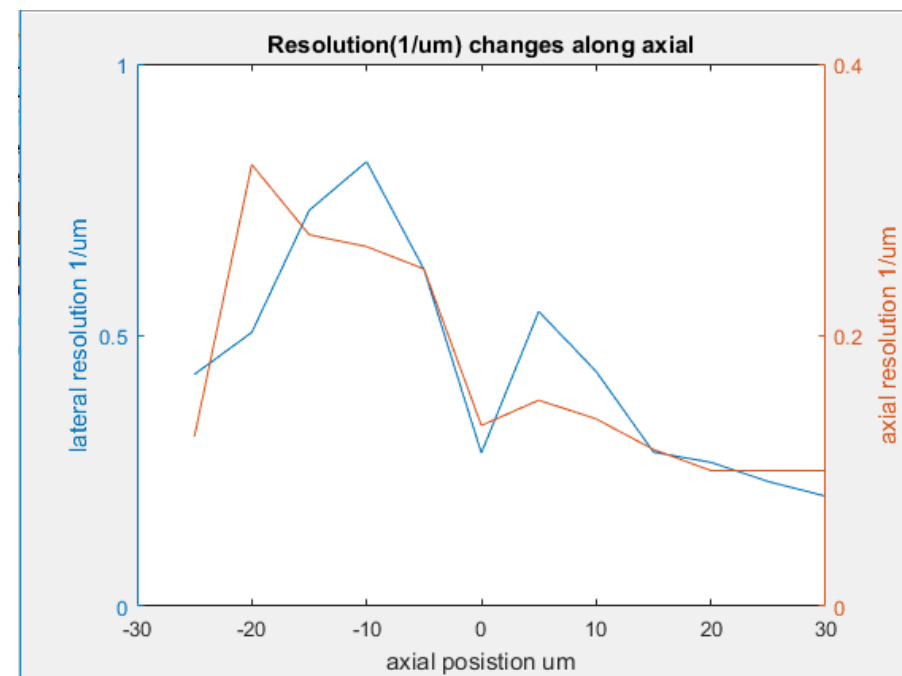
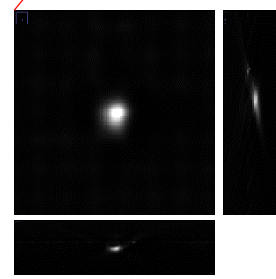
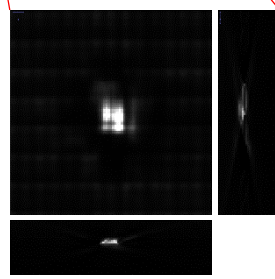
Lateral: 2.31um Axial: 7.24um

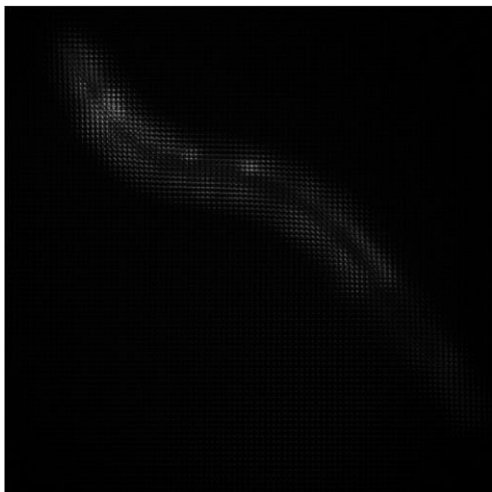
Z = 15um
Lateral: 3.52um Axial: 8.65um

Z = 20um
Lateral: 3.77um Axial: 10um

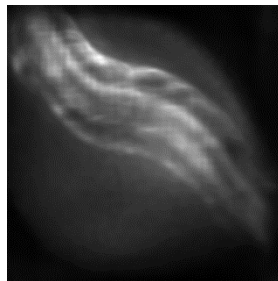
Z = 25um
Lateral: 4.35um Axial: 10um

Z = 30um
Lateral: 4.93um Axial: 10um

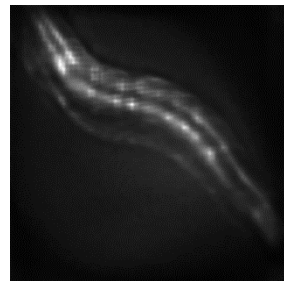




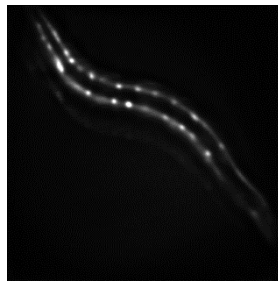
C.elegans Muscle Nucleus labeled
GFP channel 518nm
Single exposure: 100ms



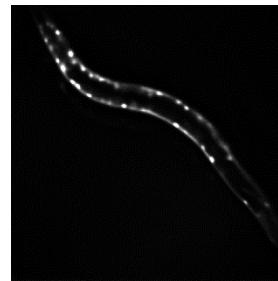
Z = -60um



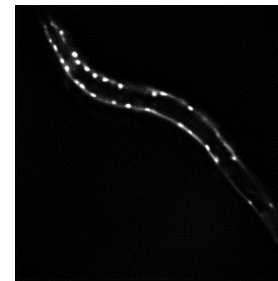
Z = -44um



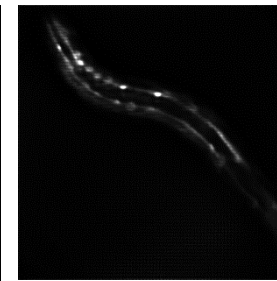
Z = -36um



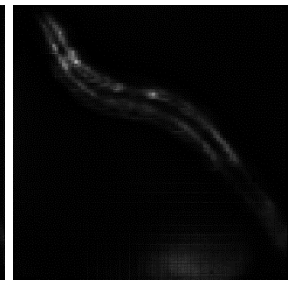
Z = -20um



Z = -16um



Z = -8um



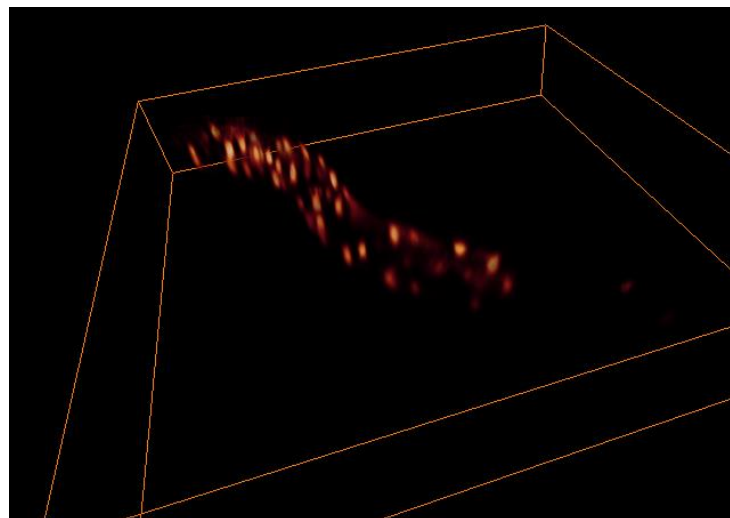
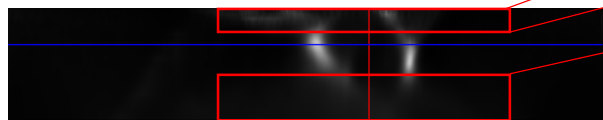
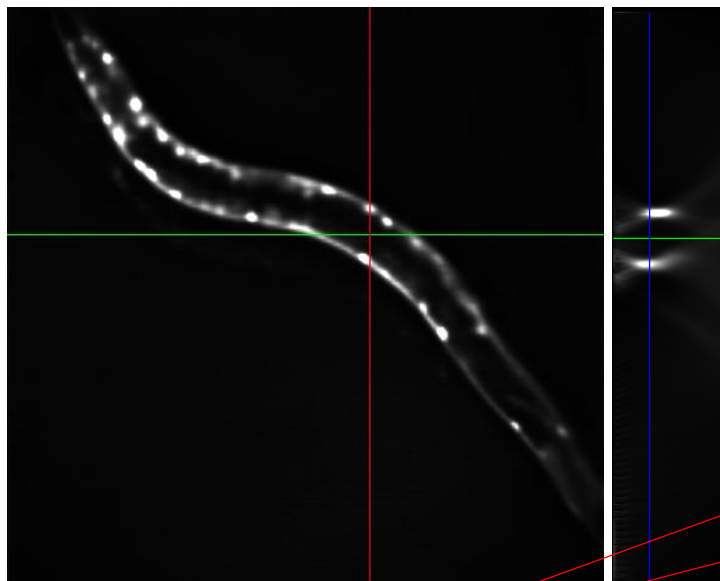
Z = 0um

Seriously blurred

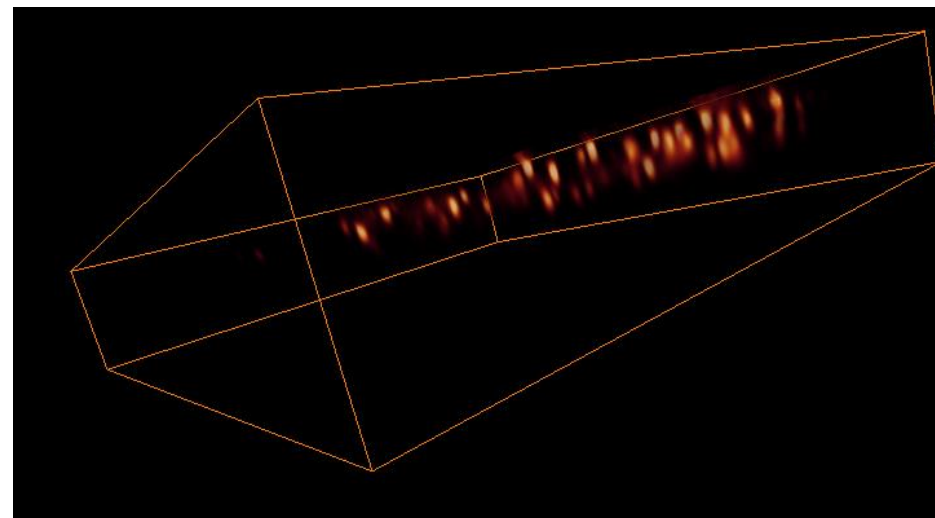
Useful Stacks (~30um)

Deteriorated

LF Raw
Worms are placed off the focal
plane(Objective side)

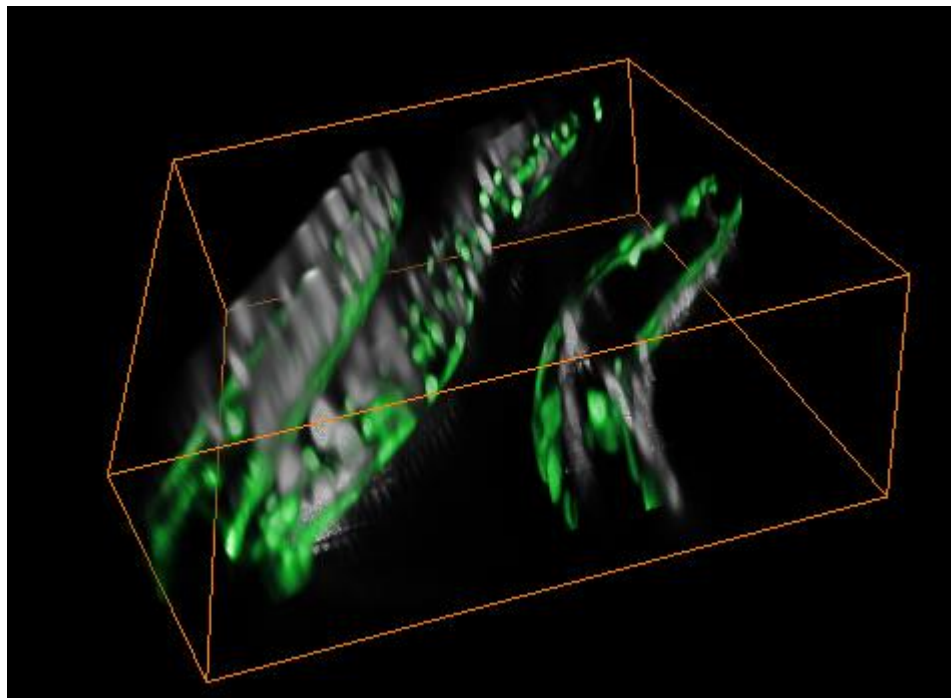


Deteriorated



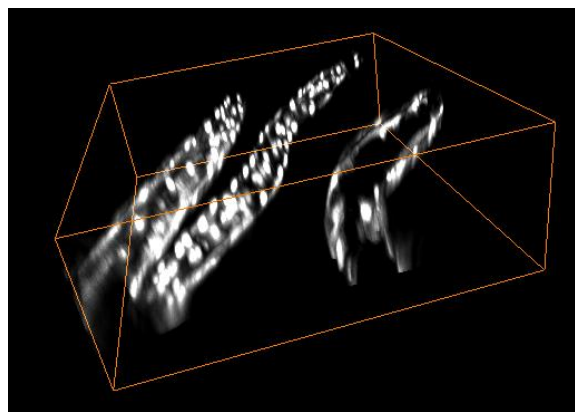
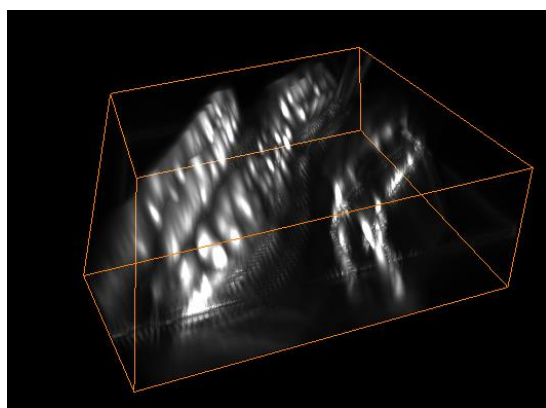
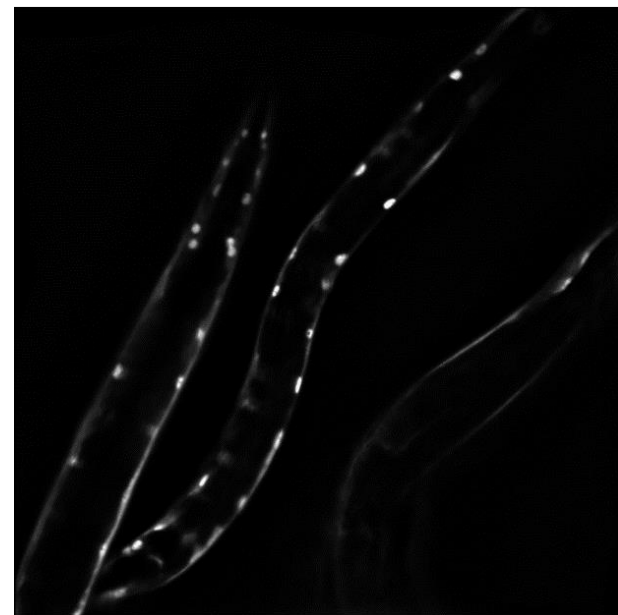
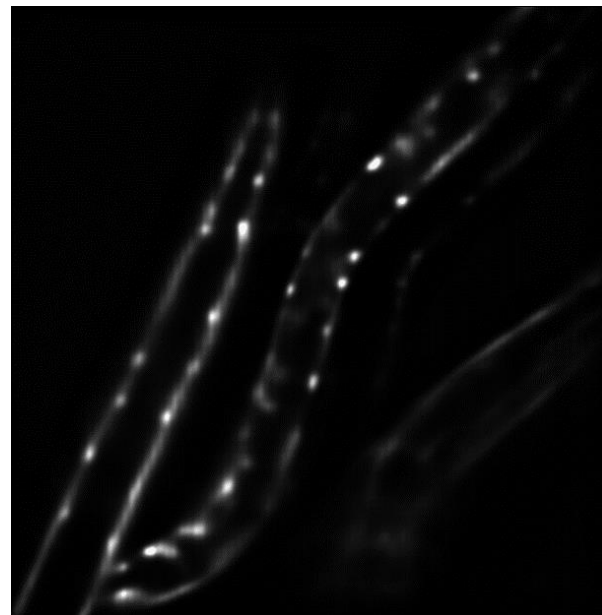
Seriously blurred





LFDM Iter:8

Widefield Deconvolution Iter:30



LFDM

Widefield Deconvolution

