

# Tutorial 3: Generating *in-silico* microscopy image with different resolution ( $f_s$ ) and brightness ( $I_0$ )

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## 1 Generate PSF

In this tutorial, we will create images for two different  $f_s$  600 and 800, and three different  $I_0$  0.1, 0.2, 0.3 for each  $f_s$ . Since we created the PSF for  $f_s = 800$  in Tutorial 1, we can reuse those files. We generate the PSF files for  $f_s = 600$  using the command,

```
Tut3$ siliscopy gen_psf --method gandy --paramfile param_600.dat  
--calc all --output PSF_gandy --multiprocess
```

This command reads the following variables from `param_600.dat`,

- `beta` = 1.037 rad, or `NA` = 1.3 and `meu` = 1.51.
- `dln` 0.1, 0.1, 0.2
- `Plmn` = 15, 15, 25
- `fs` = 600
- `lam[i]` = 670, 518

## 2 Generate *in-silico* monochrome image intensities

This step, is similar to **Tutorial 1**. Instead of `parameter.dat`, we have two parameter files `param_800.dat` and `param_600.dat`. The major difference between `param_600.dat` and `param_800.dat` is the value of `fs`. The monochrome image intensities for each  $f_s$  is calculated using the commands,

```
Tut3$ siliscopy gen_mono --file dp100.gro --paramfile --param_800
.dat --psf PSF_gandy --output img100
Tut3$ siliscopy gen_mono --file dp100.gro --paramfile --param_600
.dat --psf PSF_gandy --output img100
```

These commands reads the following parameters from param\_800.dat or param\_600.dat.

- $f_s = 800$  or  $600$
- $\text{lam}[i] = 670, 518$
- $\text{lam\_names}[i]$
- $\text{dlmn} = 0.1, 0.1, 0.2$
- $\text{Plmn} = 15, 15, 25$
- $\text{maxlen} = 25, 25, 25$
- $\text{focus\_cor} = 12.5$
- $\text{opt\_axis} = 2$
- $\text{pbc} = \text{xyz}$

### 3 Generate colored *in-silico* microscopy images

To generate the images with different  $I_0$  and  $f_s$  we use the script `gen_I0_fs.sh`,

```
Tut3$ bash gen_I0_fs.sh
```

In the script, value of  $I_0$  is changed using the replace function of `sed`, where  $\{fs\}$  takes the value of 600 and 800. The command in line 14, calculates the colored images.

```
11 sed "s/lam_I0_1\s*=./lam_I0_1=$I0/g" param_${fs}.dat > foo.dat
12 sed -i "s/lam_I0_2\s*=./lam_I0_2=$I0/g" foo.dat
13 siliscopy plot --file img --paramfile foo.dat --method color \
14 --timestep 100 --calc specific
```

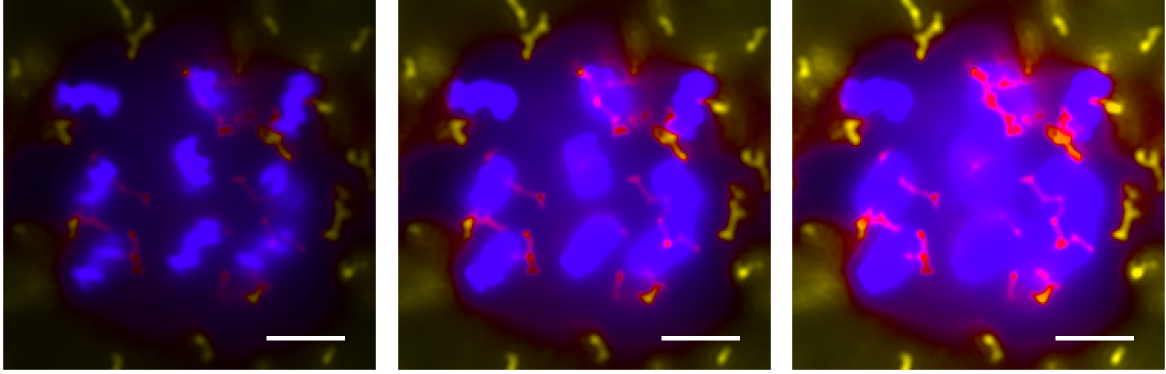
This command uses the image intensities generated in the previous step, and reads the following variables from `parameters.dat`

- $f_s = 800$
- $\text{lam}[i] = 670, 518$
- $\text{lam\_I0\_}[i] = 0.13, 0.25$
- $\text{lam\_hue}[i] = 255, 60$
- $\text{dlmn} = 0.1, 0.1, 0.2$
- $\text{maxlen} = 25, 25, 25$
- $T = 1$
- $\text{scale} = 5$
- $\text{dpi} = 600$
- $\text{opt\_axis} = 2$

This creates six JPEG image files:

- `img100_fs600_T1_I_0.1_0.1.jpeg`
- `img100_fs600_T1_I_0.2_0.2.jpeg`
- `img100_fs600_T1_I_0.3_0.3.jpeg`
- `img100_fs800_T1_I_0.1_0.1.jpeg`
- `img100_fs800_T1_I_0.2_0.2.jpeg`
- `img100_fs800_T1_I_0.3_0.3.jpeg`

**Images for  $f_s = 600$ :**  $I_0 = 0.1$  (left),  $0.2$  (middle), and  $0.3$  (right)



**Images for  $f_s = 800$ :**  $I_0 = 0.1$  (left),  $0.2$  (middle), and  $0.3$  (right)

