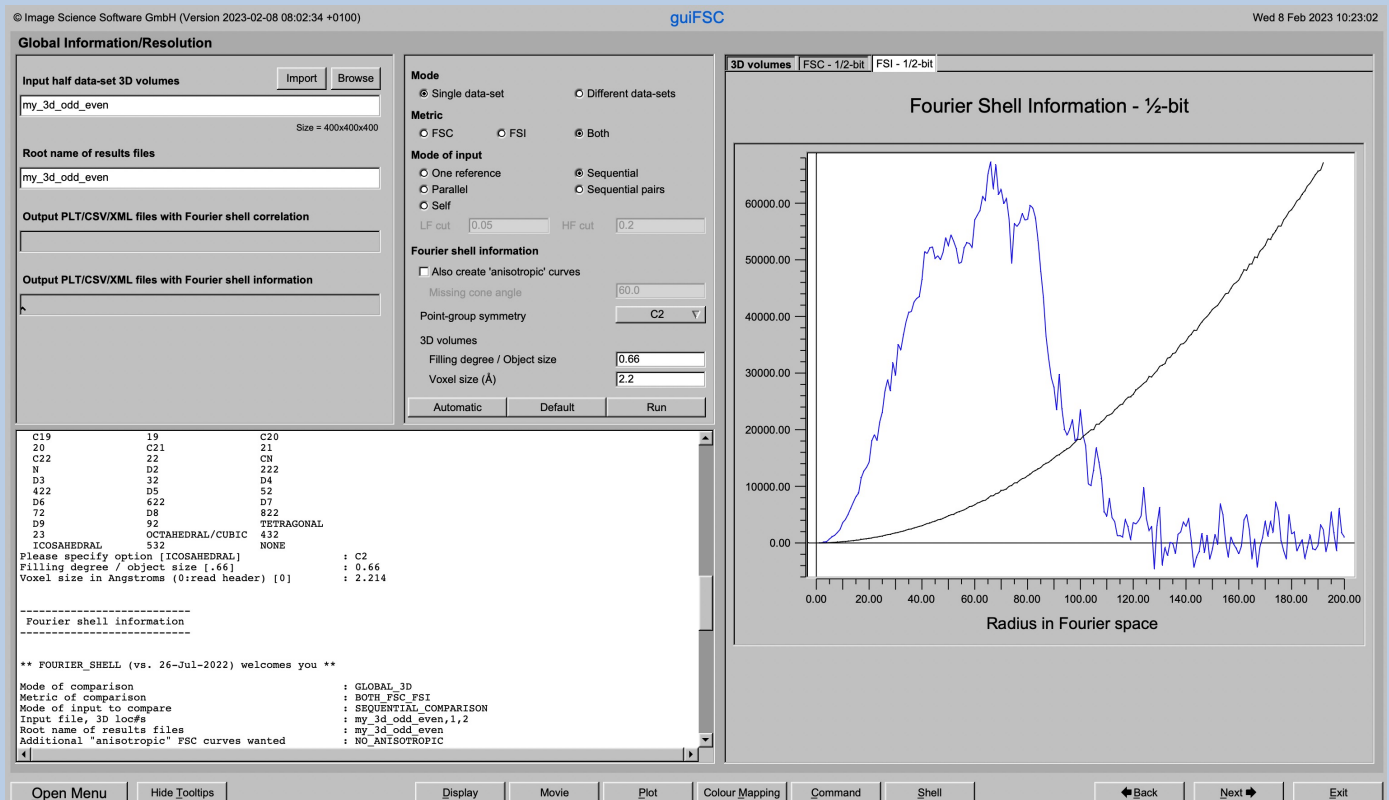




A Brief Introduction

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www.ImageScience.de
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The IMAGIC guiFSC program



The **guiFSC** program calculates the global and/or local resolution and/or information content within images/3D volumes/spectra.

This is a brief hands-on on how to use IMAGIC GUI oriented programs and how to work with **guiFSC**:

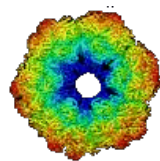
CONTENT:

- IMAGIC GUI programs How to use IMAGIC GUI programs
- **guiFSC** How to calculate the global and the local resolution / Information content
- Error hints How to send us feedback

FOURIER RING/SHELL INFORMATION, FOURIER RING/SHELL CORRELATION:

Refer to our internet pages <https://www.ImageScience.de/metrics> and <https://www.ImageScience.de/fsc>.





IMAGIC

GUI Programs

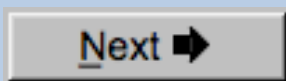


Workflow

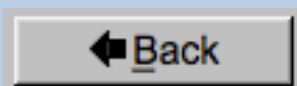
The idea of **guiFSC** is to guide you through a typical procedure to get the global and local resolution/information content.

The workflow consists of several pages. Each page will perform a specific image processing step.

If the calculations are finished the results are shown and you can press the “Next” button to continue with the next page.



Of course, there is also a “Back” button. But be careful: when leaving a page the results shown on the page may get lost and when coming back you might have to do the calculations once more to get the results printed. The output files do not get lost, of course.



The Working Directory

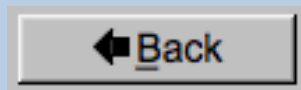
If **guiFSC** is called from the programs list, by using an icon or in a command line the working directory will be your default system directory.

If **guiFSC** is called by an IMAGIC command in a terminal / command window

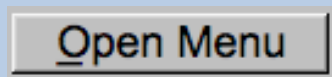
```
IMAGIC-COMMAND : guiFSC
```

the working directory will be the directory used in this window.

If you want to change this directory use the “Back” button(s)



or the “Open Menu” button



to navigate to the “Start” page where you can specify the working directory of **guiFSC**.

All output files will be stored in the working directory which you have specified on the start page.

Input files can be chosen from other directories.

NOTE:

guiFSC will start with the “Global Information/Resolution” page. You need to prepare the data you can use the "Next" or "Menu button" to navigate to these these pages.



Help

Move the cursor on (nearly) any item (questions, radio buttons, display windows...) shown on the pages and you will get context sensitive help.

Output file:

whgb_micrograph

Name of the output IMAGIC file containing the imported micrographs.

Note that the name of this output file will be created automatically.

Select format ▼

In case of type conflicts

Select the input file format.

Note: Currently only TIFF and MRC files can be imported.

MRC:
This is one of the oldest image formats in use in electron microscopy. One of the philosophies behind this data format is that it is compatible to the CCP4 format in use in X-ray crystallography.

TIFF (Tagged Image Format):
This has become one of the standard formats in desk-top publishing oriented image processing.



Input Files

Usually the input files on each page are output file(s) from the previous page(s) and are suggested automatically.

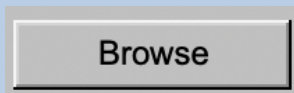
You can, of course, always use other input files names and even use other input directories.

To specify the input file you can enter the name of the file into the text field:

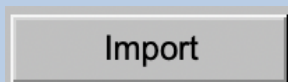


A screenshot of a software interface showing a text input field labeled "Input image(s)". The text "my_images" is entered into the field. To the right of the field are two buttons: "Import" and "Browse".

Or use the “Browse” button to browse for an IMAGIC image file (see net page):.



If the input file is in an IMAGIC but a 3DEM file use the “Import” button to create an IMAGIC image file. Note that a separate “EM2EM” window will open to calculate this conversion.

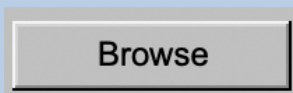


Refer to the **guiEM2EM** manual for further help.

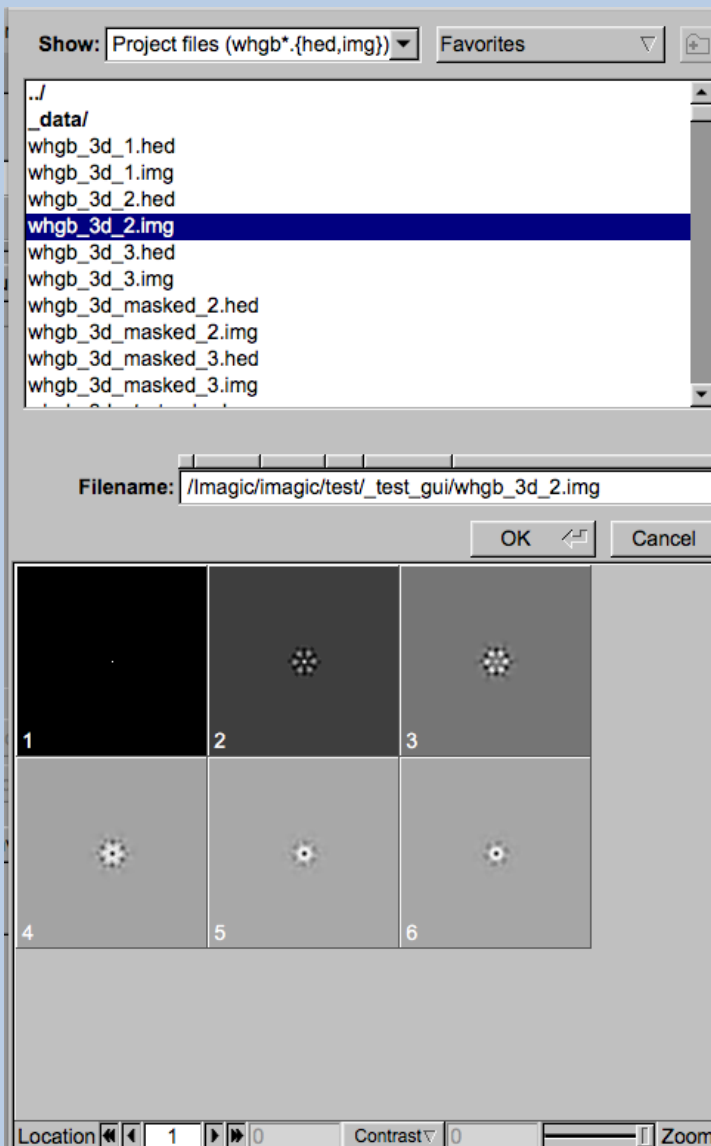


Input File Chooser

In most of the pages you are asked for input file(s) and you will find a “Browse file” button:

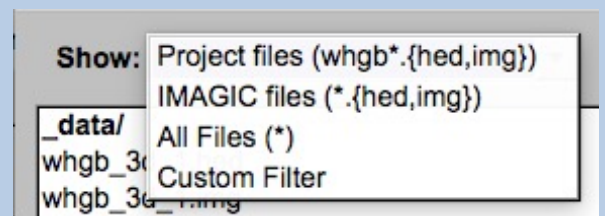


Pressing this button will open the IMAGIC file chooser:

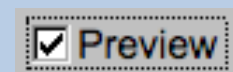


Choose the wanted file by clicking its name

You can use a pre-selection of the files shown:



If the images are in IMAGIC format you can get a pre- view of the images.



Note that you can store your directory in “Favorites”.



Output Files

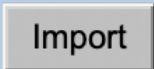
Usually the names of the output files are suggested but it is your choice, of course. On each page you can specify these output file names on the left hand side. Enter the name of the file into the text field:

Output file	Export
my_images	

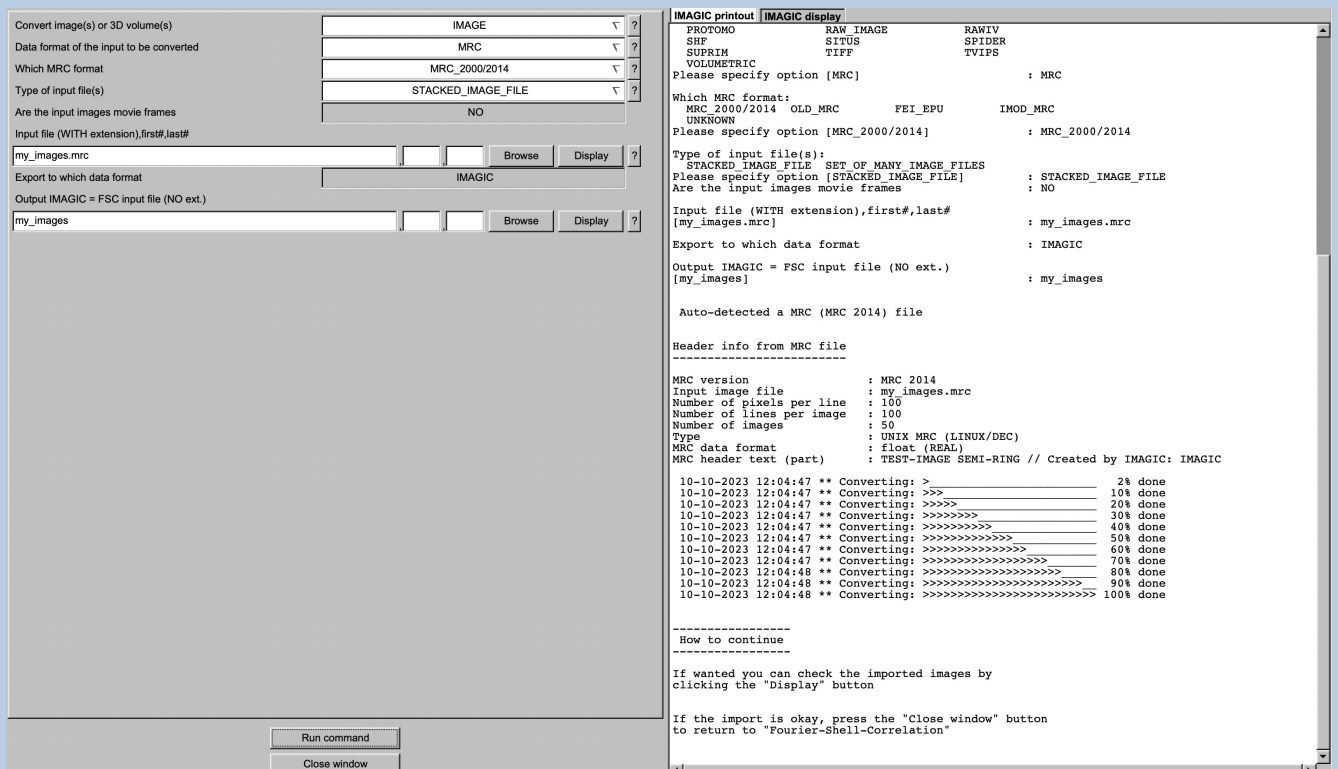


Import Buttons

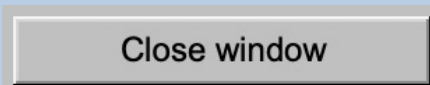
You do not want to use the “Import page” you can use the “Import” button to import the input images/3D volumes from any 3DEM format. The “Import” button which is located above the text field specifying the name of the related file.



An additional “IMAGIC EM2EM” page will open. Specify all parameters needed and click the “Run command” button to import the images / 3D volumes:



Click the “Close window” button to exit this additional window:

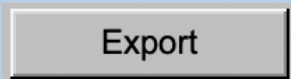


Refer to the **guiEM2EM** manual to get further help.




Export Buttons

You can export output images/3D volumes to any 3DEM format. Click the “Export” button which is located above the text field specifying the name of the related file.



An additional “IMAGIC EM2EM” page will open. Specify all parameters needed and click the “Run command” button to export the images / 3D volumes:

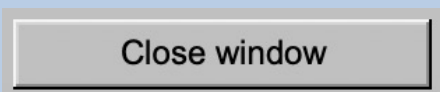
The screenshot shows the IMAGIC EM2EM software interface. On the left is a configuration panel with various options and dropdown menus. On the right is a terminal window displaying the command-line interface of the software. The configuration panel includes fields for input file location, output format, and data format. The terminal window shows the execution of the 'EM2EM' command with various parameters and options, resulting in a list of image files and their properties.

Convert 2D image(s) or 3D volume(s) [2D_IMAGE]
Data format of the input to be converted [IMAGIC]
How are the input images available [UNKNOWN_IMAGE_FILE]
Are the input images movie frames [No]
Input file, image loc#s [my_images]
Export to which data format [TIFF]
Type of output TIFF image(s) wanted [GREY_SCALE_IMAGE]
Type of output file [STACKED_IMAGE_FILE]
Output file, loc#s (WITH ext.),first#,last# [my_images.tif]
Always scale densities to the output format [Yes]

IMAGIC printout IMAGIC display
Convert 2D image(s) or 3D volume(s):
2D_IMAGE 3D_VOLUME : 2D_IMAGE
Please specify option [2D_IMAGE]
Data format of the input to be converted:
BROOKHAVEN_STEM CCP4 DATA_ONLY
DICOM DIGITAL_MICROGRAPH EM
FEI FABOSA FORMATTED
IMAGIC JPEG KONTRON
MDPP MEDIPIX MRC
OFFSET PIF PGM
PROTOMO RAW SHF
SMV SPIDER SUPRIM
TIA/EMI/SER TIFF TVIPS
Please specify option [IMAGIC]
Type of input file:
SINGLE_IMAGE_FILE STACKED_IMAGE_FILE UNKNOWN_IMAGE_FILE
Please specify option [UNKNOWN_IMAGE_FILE]
Are the input images movie frames [NO]
Input file, image loc#s [my_images]
Export to which data format:
CCP4 DATA_ONLY EM
FORMATTED FEI_RAW_IMAGE IMAGIC
JPEG_GREYSCALE KONTRON MDPP
MRC OFFSET PIF
PGM POSTSCRIPT PROTOMO
RAW SHF SMV
SPIDER SUPRIM TIFF
TVIPS
Please specify option [TIFF]
Type of output TIFF image(s) wanted:
COLOUR_IMAGE GREY_SCALE_IMAGE
Please specify option [GREY_SCALE_IMAGE]
Type of output file:
STACKED_IMAGE_FILE SET_OF_MANY_IMAGE_FILES
Please specify option [STACKED_IMAGE_FILE]
Output file, loc#s (WITH ext.),first#,last# [my_images.tif]
Always scale densities to the output format [YES]
Image name: MOVIE SUM FROM whgb.c4.img (7 IMAGES) (PREPARE)
Size: 200, 200 Loc: 1 Type: REAL Cre.Date: 26-Jan-2023 Time: 11:16:03
EMEM;EXCOPY/PLT;EXCOPY/SELECT;CAMERA NORM;INCDMENU/ANISOTROPIC MAGNIFY=1.0,1
.026;COARSE;ALIDIR;COARSE;SUMMER/MOVIE SUM;INCDMENU/PREPARE/BP LOW=0.02 TRANS
=0.0 HIGH=0.9;CTF2D_FLIP;CUT_IMAGE/APERIODIC;

Run command
Close window

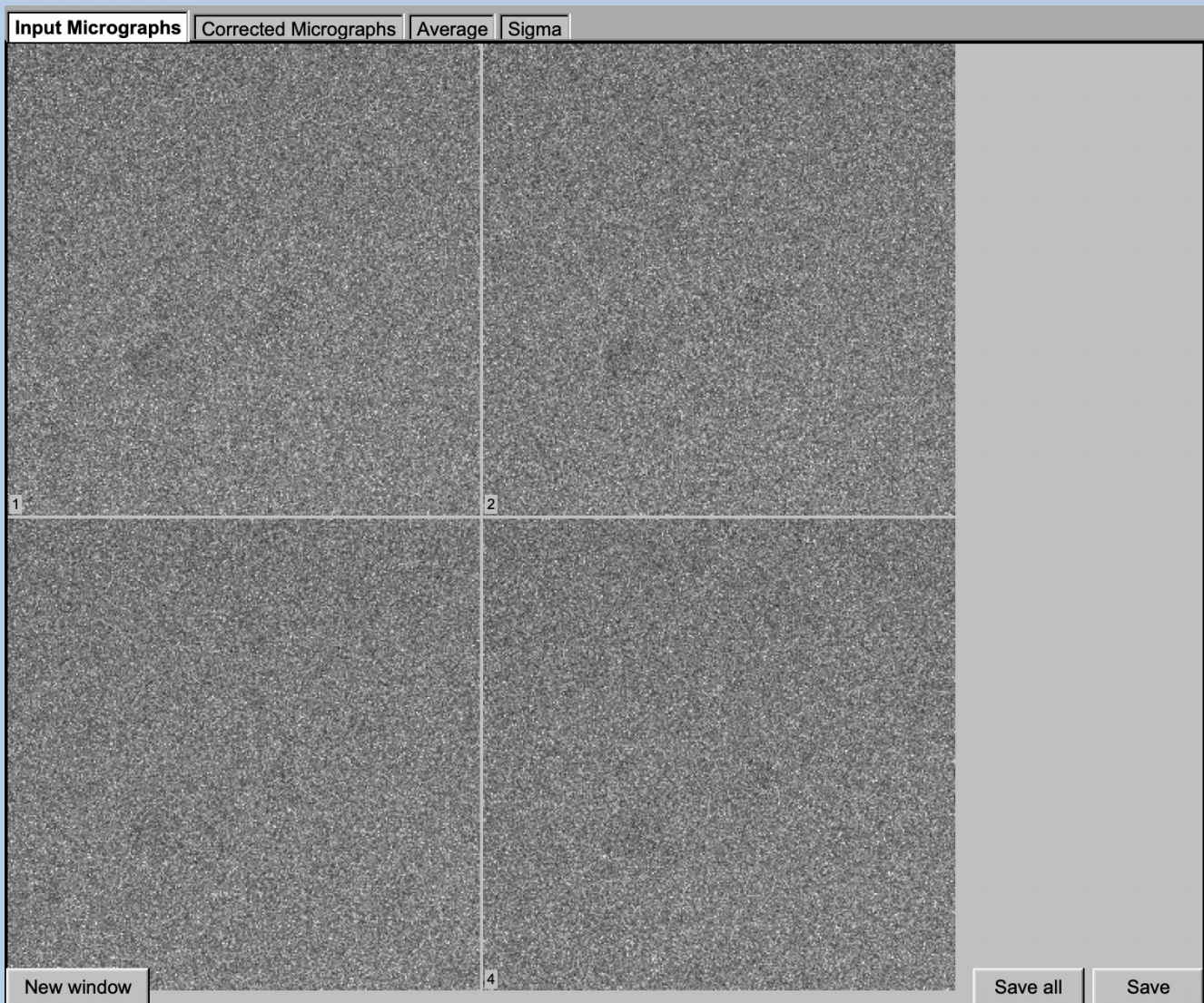
Click the “Close window” button to exit this additional window:



Refer to the **guiEM2EM** manual to get further help.



Display



In the right part of a typical **IMAGIC GUI program** page you will find displayed images - usually the input and the output images.

You can press the tabs to toggle between the various displays.

Double click into the wanted images or use the "New Window" button to get an enlarged display window. Use "Save" to store the display (JPG).

To adjust the display settings use the related display control tab on the left hand side of the page. Refer to **guiDISPLAY**.



“Display Control” Tabs

The visualisation settings of images is shown on the right-hand side of each **IMAGIC GUI program** page can be adjusted in its own related “Display control” tab on the bottom left part of each page. Also refer to **guiDISPLAY**.

Grey value scaling: Adjust the contrast

Min/Max: Scale the grey-values to minimum/maximum

Interactive: Set the limits by giving numbers

Sigma: Use an amount of sigma to set the limits

Contrast

How to calculate the grey value scaling

Local: Calculated in each image separately

Global: Calculated using all image densities
(as displayed in the histogram)

Gallery: Calculated in the currently displayed images

Inverse contrast:

Use one of the radio buttons

Zoom

Enlarge the displayed images

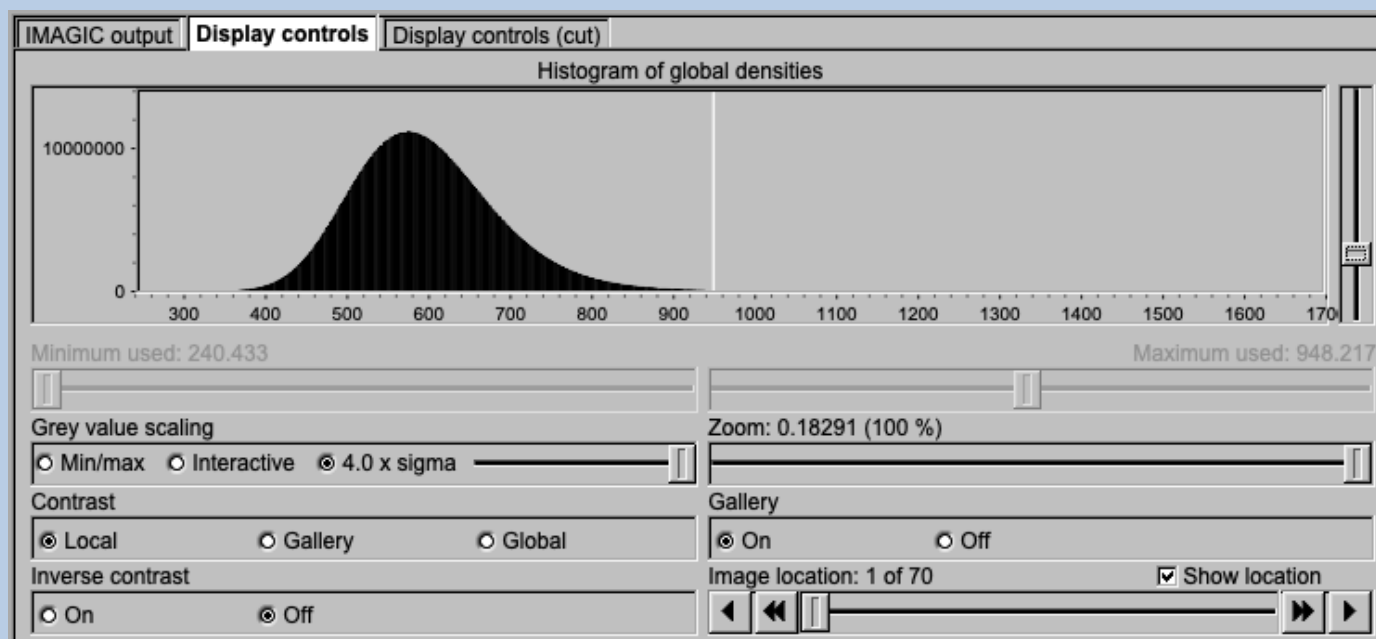
Gallery

On Display the images in a gallery
(may be you need another zoom to see more than one image)

Off Show only one image

Image Locations.

Use the slider or the arrows to select image locations



“Plot Control” Tabs

The visualisation settings of curves/spectra is shown on the right-hand side of an **IMAGIC GUI program** page can be adjusted in its own related “Plot control” tab on the bottom left part of each page. Also refer to **guiPLOT**.

Style, Colour, Grid: Adjust the curve line style, the colour and add a grid if wanted

Horizontal, vertical scaling: Set minimal and maximal horizontal or vertical limits

Plot title Set the text of the plot title

Text along ... Set the text along the given axis

Use for all plots: Use the setting for all plots in a file independent of what is input in the PLT file

Reset:. Reset to the automatic values

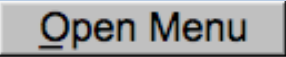
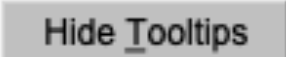
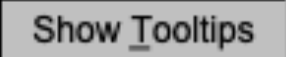
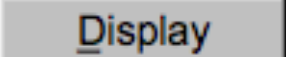
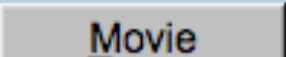
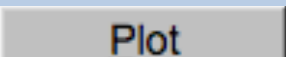

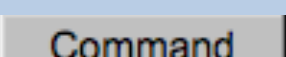
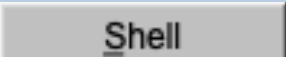
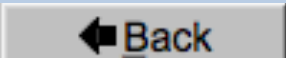
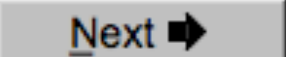
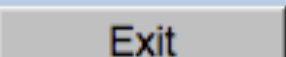
Style Select curve style ▾	Colour Select curve colour ▾	Grid Select curve grid ▾
Horizontal scaling 1.00	<input type="checkbox"/> Use for all plots 32.00	Reset
Vertical scaling -19.21	<input type="checkbox"/> Use for all plots 17.00	Reset
Plot title Fourier Ring Information - 1/2-bit	<input type="checkbox"/> Use for all plots	Reset
Text along horizontal axis Radius in Fourier space	<input type="checkbox"/> Use for all plots	Reset
Text along vertical axis	<input type="checkbox"/> Use for all plots	Reset



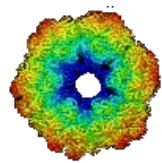
The Toolbar

There is a toolbar at the bottom of each **guiFSC** page.

The toolbar buttons:

	Open the MENU to navigate to each page wanted
	Show or hide the context sensitive tooltips (the help text may sometimes disturb)
	
	Open a DISPLAY page to visualize IMAGIC images. Refer to guiDISPLAY .
	Open a MOVIE page (display in an endless loop). Refer to guiDISPLAY
	Open a PLOT page to show IMAGIC curves. Refer to guiPLOT
	Open a DISPLAY page to visualize IMAGIC images using a colour map stored in another input.
	Open a list to run any IMAGIC command. Refer to guiIMAGIC .
	Run a shell / terminal page. command
	Go to the previous page
	Continue with the next page
	Exit guiFSC



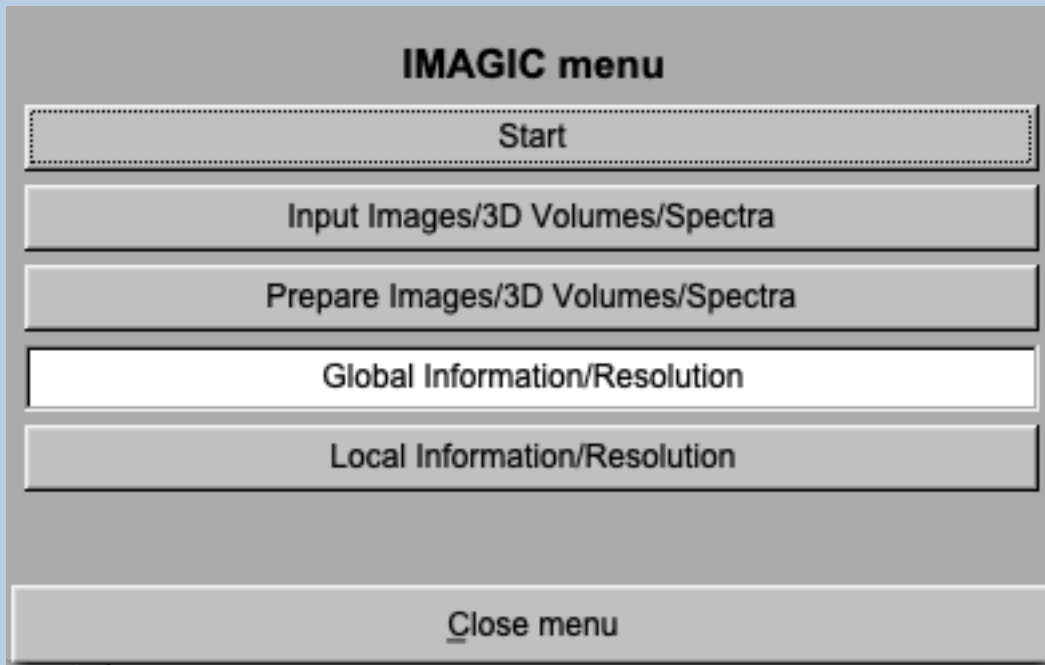


IMAGIC

guiFSC



The guiFSC Menu



PAGES:

Start	Page to adjust guiFSC program parameters
Import Images...	Import or specify the input. Cut out a part, if wanted.
Prepare Images...	Pre-treatment: Mask, filter, normalise variance, resize, summing ...
Global information/Resolution	Calculate the global information content / resolution of the input data
Local information/Resolution	Calculate the local information / resolution maps of the input data

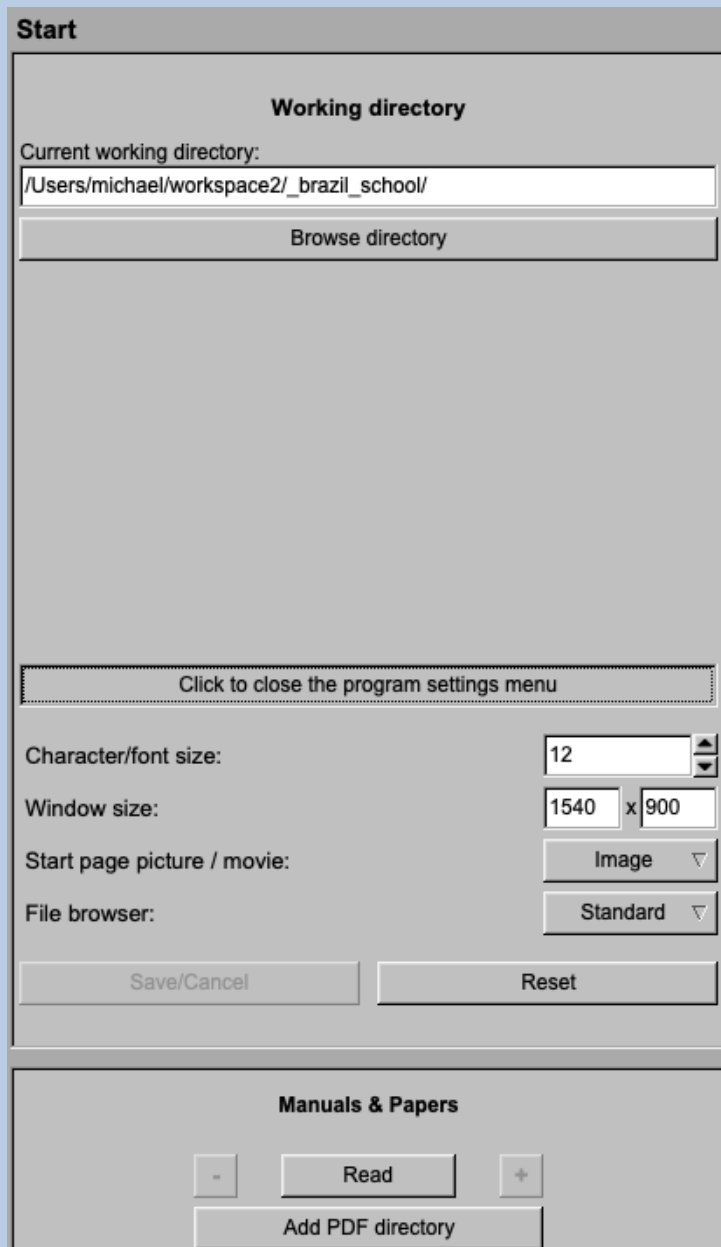
NOTE:

guiFSC will start with the “Global Information/Resolution” page. If you need to prepare the data you can use the IMAGIC menu buttons to navigate to the wanted pages.



The “Start” Page

This page is not part of the **guiFSC** workflow and can only be reached using the “Back” or the “Open Menu” button(s).



On this page you can set some program parameters:

- a) the working directory
- b) the size of the **guiFSC** program windows and/or text
(a re-start is needed)
- c) the type of file browser



Start Working

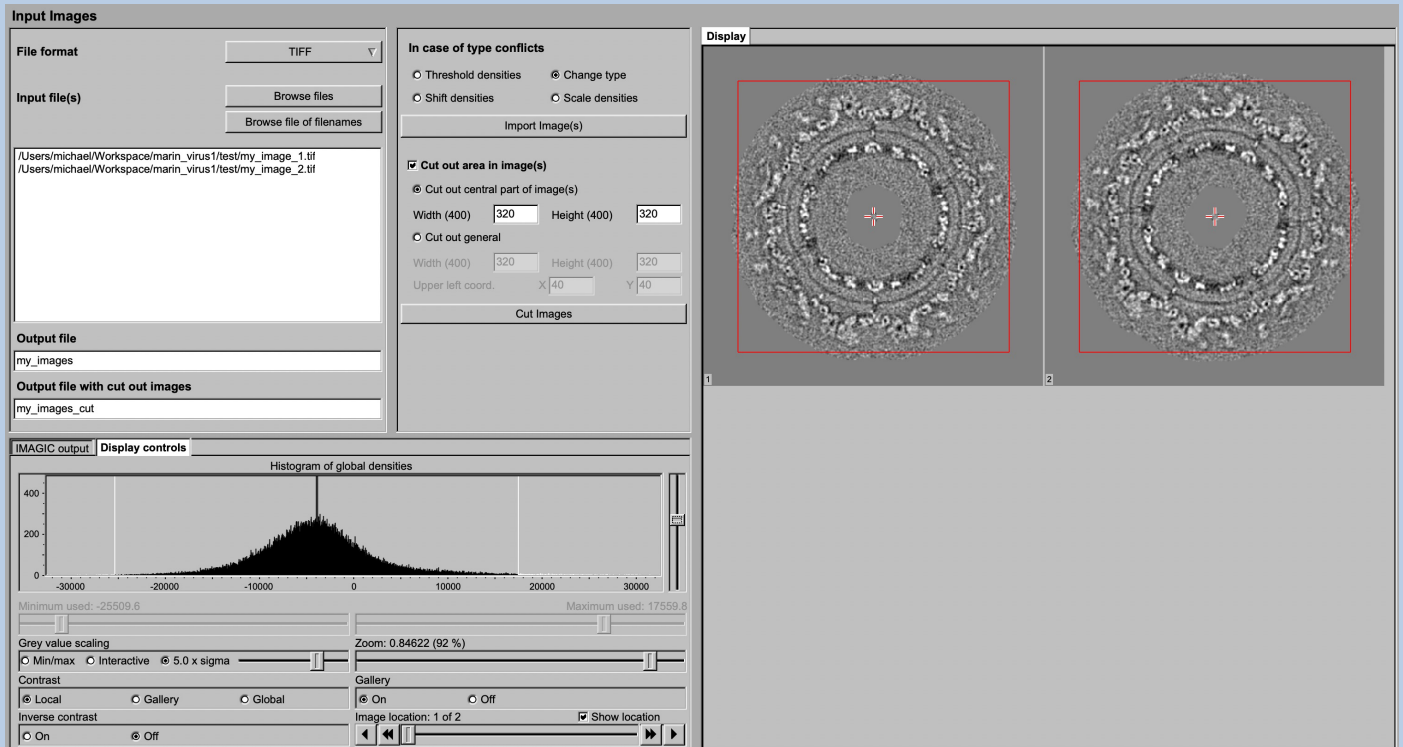
guiFSC starts with the “Global Information/Resolution” page.

The workflow using the “Next” button will guide you through all Global Information/Resolution pages.

If you need to prepare the data you can use the “Back”, “Next” or “Open Menu” buttons to navigate to these preparation pages.



The “Import” Page



DESCRIPTION:

Convert import image/3D volume/spectra files using any 3D-EM format (or TIFF) into a single (stacked) IMAGIC image file.

The page can be skipped if your input images/3D volumes/spectra are already stored in IMAGIC format.

If wanted you can cut-out parts of the input.

Also refer to program **guiIMPORT**.



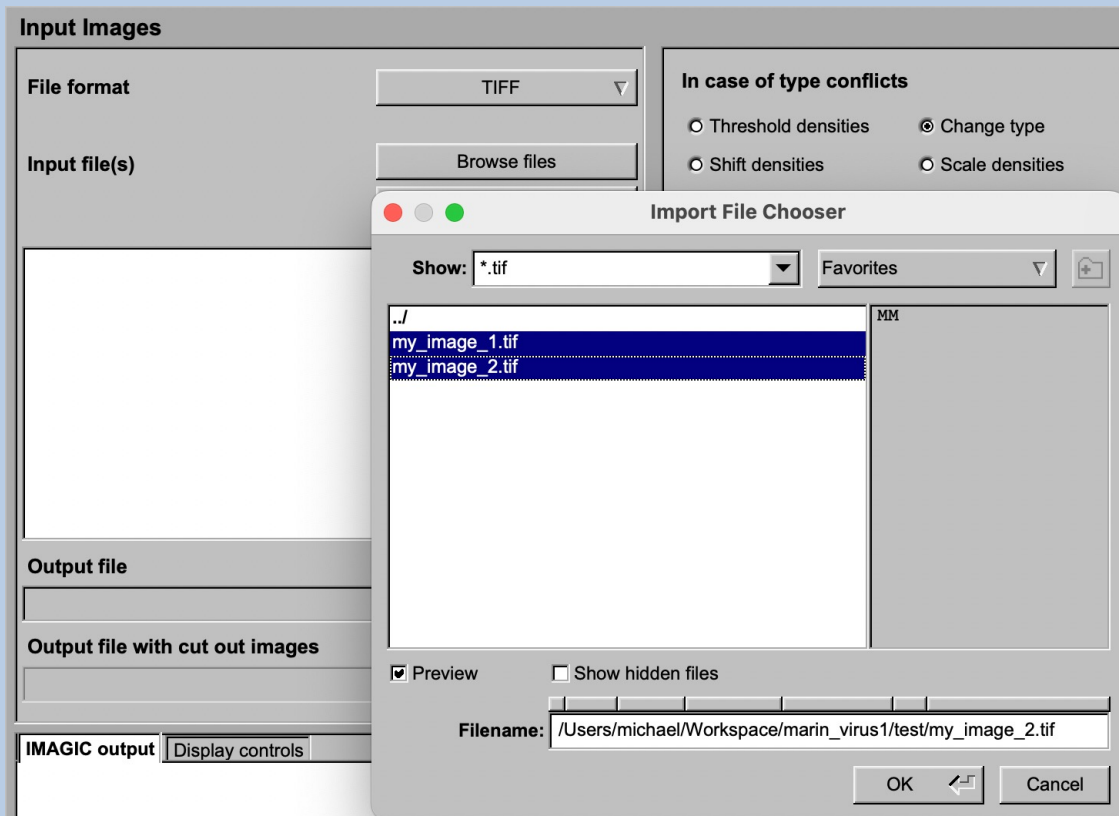
IMPORT :

Specify the file format in which your input images/3D volumes/spectra are stored. Click the “Select format” button



and choose one of the formats in the listing.

Now you can specify the input files or a “File of filenames” text file (containing the names of the wanted input files) with the “Browse” button. Refer to chapter “Input Files” and “Input. File Chooser” for help.



If wanted you can edit the list of files. But be careful there is no automatic control of file names in this list.

```
/Users/michael/Workspace/marin_virus1/test/my_image_1.tif  
/Users/michael/Workspace/marin_virus1/test/my_image_2.tif
```

Next, you need to specify the name of the output file which is the IMAGIC image file which will contain the imported images/3D volumes/spectra.

Depending on the format of the input you have to specify a number of parameters or options.

Format TIFF, for example:

In case of type conflicts

- Threshold densities
- Change type
- Shift densities
- Scale densities

Having specified every information needed click the “Import” button to start the import of the images/3D volumes/spectra.

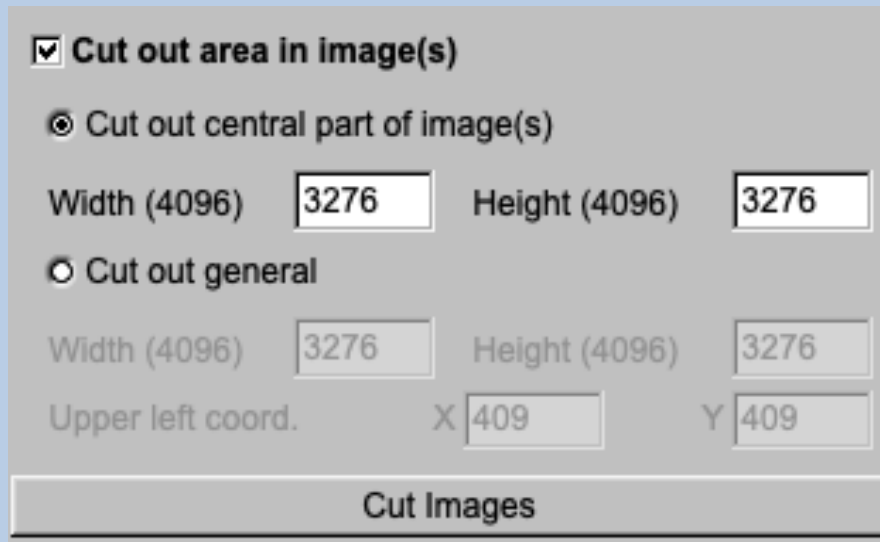
The imported images/3D volumes/spectra are shown in the display/plot tab on the right-hand side. See chapters “A Typical Page - Display control tabs” or “A Typical Page - plot control tabs”.



CUT:

Having imported the input images/3D volumes/spectra, you may want to not use the full size but only a part of them.

Clicking the “Cut out area” option you can cut-out parts of the imported images/3D volumes/spectra :



Cut out area in image(s)

Cut out central part of image(s)

Width (4096) Height (4096)

Cut out general

Width (4096) Height (4096)

Upper left coord. X Y

Cut Images

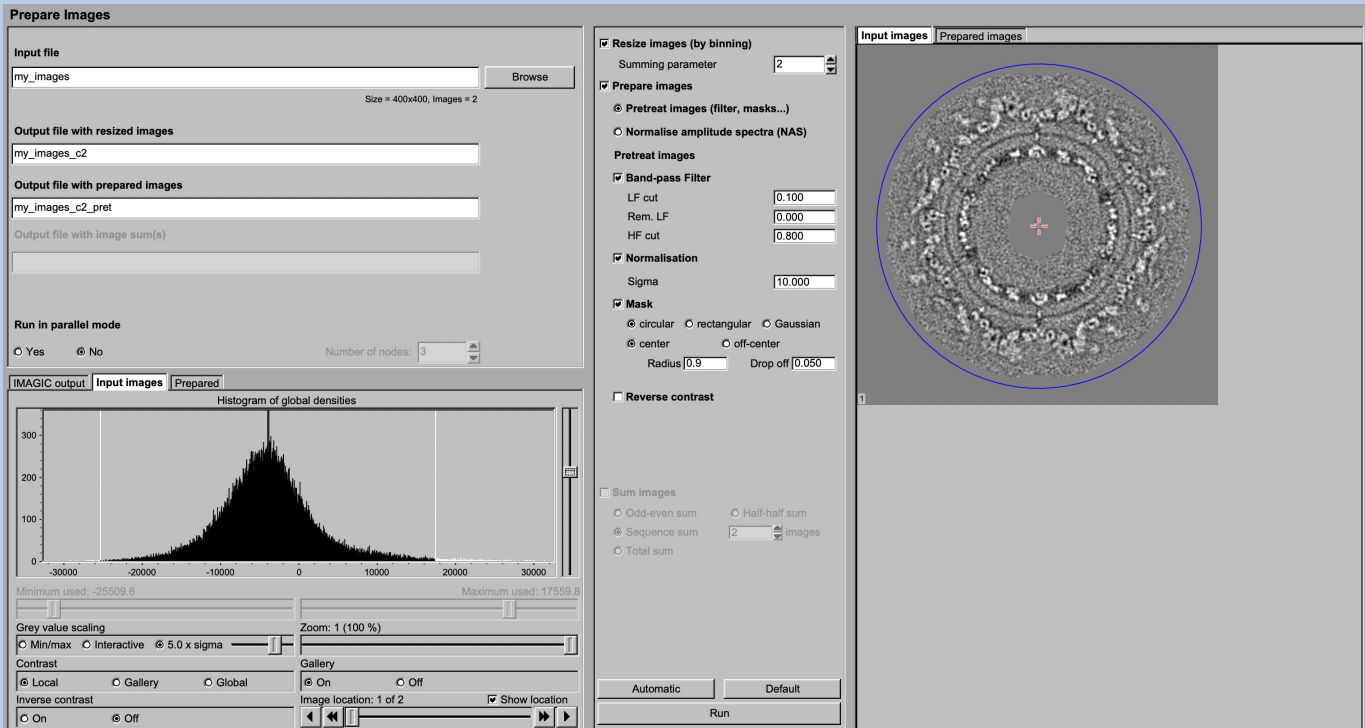
The chosen part is shown in the display window. You can cut-out a central part or any part wanted. The cut-out part is the same in all images/3D volumes/spectra, of course.

The name of the output file containing the cut-out images/3D volumes/spectra is suggested on the left-hand side. As usual you can change this name, of course.

Having specified everything click the “Cut” button to run the calculations.



The “Prepare” Page



DESCRIPTION:

It can be helpful to pre-treat the input import image/3D volume/spectra by imposing a band-pass filter, normalise the variance, impose a mask and...

NOTE:

Of course, you can skip this page if no such treatment is wanted/needed.



You can resize the images by binning

Resize images (by binning)

Summing parameter

You can pre-treat the images. Options are

Prepare images

Pretreat images (filter, masks...)

Normalise amplitude spectra (NAS)

Pretreat images

Band-pass Filter

LF cut

Rem. LF

HF cut

Normalisation

Sigma

Mask

circular rectangular Gaussian

center off-center

Radius Drop off

Reverse contrast

Options are band-pass filtering

Band-pass Filter

LF cut

Rem. LF

HF cut



normalise the variance in each image

Normalisation

Sigma

imposing a mask

Mask

circular rectangular

center off-center

Radius Drop off

if wanted you can also reverse the contrast.

Reverse contrast

Instead of using these pre-treatment options you can apply a NAS filter which means that the amplitude spectra of the images are normalised:

Prepare images

Pretreat images (filter, masks...)

Normalise amplitude spectra (NAS)

Mask

circular rectangular

center off-center

Radius Drop off

Reverse contrast

NAS Filter

LF cut

Rem. LF

HF cut

Imposing a mask and reversing the contrast are also options here.



As usual, specify the names of the input and the output files:

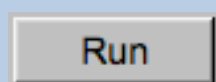
Input file
my_images Browse

Size = 400x400, Images = 2

Output file with resized images
my_images_c2

Output file with prepared images
my_images_c2_pret

Start the calculations by clicking the “Run” button:



You can also create various image sums which you may need for the subsequent calculations of the global and local information content in your images.

Sum images

Odd-even sum Half-half sum

Sequence sum images

Total sum

Output file with image sum(s)
my_images_c2_pret_odd_even_sum

Note:

The preparation was described for images. But input can also be curves/spectra/1D image or 3D volume(s) files. In this case the pages are modified for the other dimension but the content and the use of the pages are the same or similar.



The “Global Information/Resolution” Page

Global Information/Resolution

Input image(s)
my_image_1
Size = 400x400

Input image(s) to be compared
my_image_2
Size = 400x400

Root name of results files
my_image_1_2

Output PLT/CSV/XML files with Fourier shell correlation
my_image_1_2_frc

Output PLT/CSV/XML files with Fourier shell information
my_image_1_2_fri

Mode
 Single data-set Different data-sets

Metric
 FRC FRI Both

Mode of input
 One reference Parallel

Fourier shell correlation/information
 Also create 'anisotropic' curves
Missing cone angle
Point-group symmetry
2D images
Filling degree / Object size

How to continue

- Check the FRC and the 1/2-bit curve (first plot) as well as the FRI and the 1/2-bit threshold (third plot). Does the FRC curve (red) and the threshold curve (blue) intersect at a reasonable value? Does the FCI curve (red) and the threshold line (blue) intersect at a reasonable value? In both, FRC and FRI, is the resolution cross point 1/3rd away from the Nyquist frequency? (You should never claim any resolution level beyond 2/3rd of the Nyquist frequency = undersampling)
- Do both, FRC and FRI, fluctuate around zero close to the Nyquist frequency (if not: overfitting or sharp masks used?)
- Also check the FRC (red) and 3-sigma (blue) curves (second plot). If the FRC and 3-sigma curves do not intersect you did not collect a sufficient amount of data to allow a direct structural interpretation at that resolution level.
- Also have a look at the radially weighted FRI curve (4th plot). It does not give a resolution value but shows the information content.

Fourier Ring Information - 1/2-bit

Resolution: 11 Å

DESCRIPTION:

Calculate the global information content (using the Fourier ring or shell information metric (FRI/FSI) and/or the global resolution (using the Fourier ring or shell correlation metric (FRC/FSC)).

The comparison(s) can be calculated between different images / 3D volumes or by comparing each image / 3D volume with itself.



Specify if input are two different or a single data-set. Note that these two different option are not relevant for the calculations but to give better help and tool tips.

Mode

- Single data-set Different data-sets

In “Single data-set” you have to choose which of the following input modes is to be used

Mode of input

- One reference Sequential
 Parallel Sequential pairs
 Self

in “Different data-set” the input mode can be one of the following:

Mode of input

- One reference
 Parallel

Modes of input are:

➤ One reference:

The input images / 3D volumes are compared with a single reference

Input image(s) to be compared	Import	Browse
my_images		
Size = 400x400		
Reference image	Import	Browse
my_reference		



➤ Parallel:

The images / 3D volumes in the first input file 1 are compared one-by-one with the images / 3D volumes in the second input file. Both input files are expected to contain the same number of images / 3D volumes.

Input 1st half data-set 3D volume(s) Import Browse
my_images_1
Size = 400x400
Input 2nd half data-set 3D volume(s) Import Browse
my_images_2
Size = 400x400

➤ Sequential:

The images / 3D volumes to be compared are stored in a single input file. The comparison is in sequential order which means The image / 3D volume #1 is compared with #2, #2 with #3 etc.

Input images to be compared Import Browse
my_images
Size = 400x400

➤ Sequential pairs

Same as sequential but the comparison is done pair-wise: The image / 3D volume #1 is compared with #2, #3 with #4, #5 with #6 etc.

➤ Self

In case of a “Single dataset” there is an additional mode of input option “Self” which allow to calculate the information content/resolution using single images / 3D volumes which are only compared with itself but NOT with any other images / 3D volumes.

Input image(s) Import Browse
my_image
Size = 400x400



Note that in case of option “Self” you have to specify the parameters of a band-pass filter and you can add noise to remove high frequency information introduced by this very specific “self compare” technique:

Mode of input

One reference Sequential
 Parallel Sequential pairs
 Self

LF cut HF cut
 Add noise Sigma

Next you are expected to choose the wanted metric:

Metric

FRC FRI Both

Options are:

- | | | |
|------------|------|--|
| Images | FRC | Global resolution using the Fourier Ring Correlation |
| | FRI | Global information using the Fourier Ring Information |
| | Both | Calculate both, FRC and FRI |
| 3D volumes | FSC | Global resolution using the Fourier Shell Correlation |
| | FSI | Global information using the Fourier Shell Information |
| | Both | Calculate both, FSC and FSI |

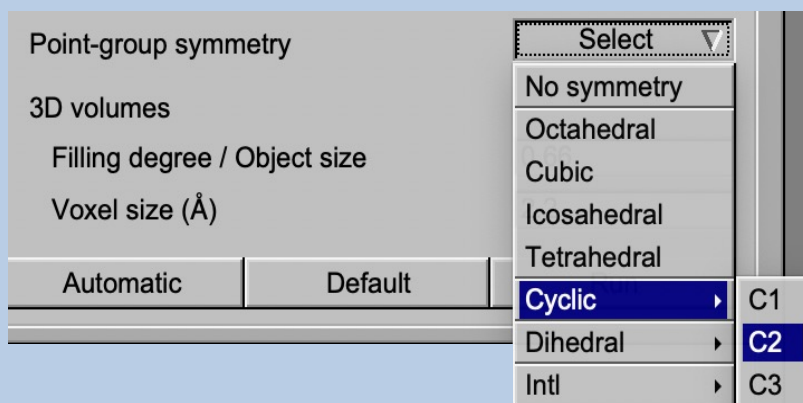
In case of input images you have to specify (or check) the filling degree (move the cursor to the input field to get help) and the pixel size:

2D images

Filling degree / Object size
Pixel size (Å)



In case of input 3D volumes you also have to specify the symmetry:



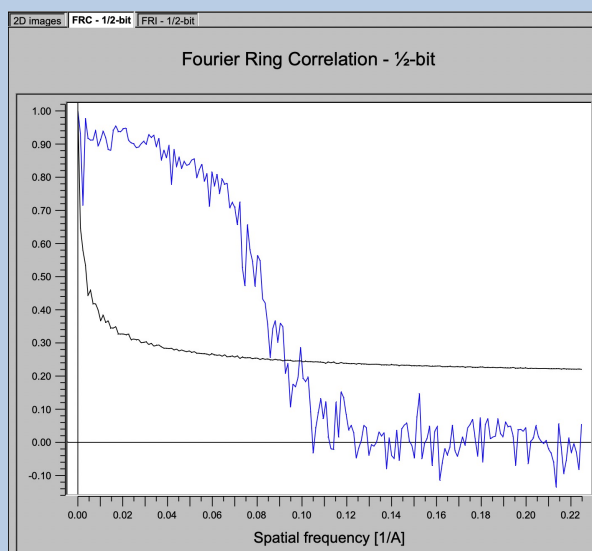
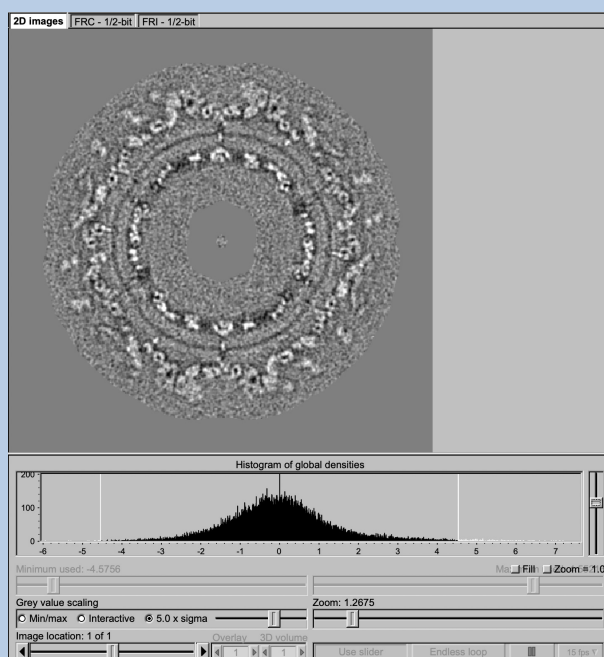
Move the cursor to an input fields to get context sensitive help.

As usual you can reset all parameters to the last values you have used by clicking the “Default” button, clicking the “Automatic” button will reset all parameters to the values suggested by **guiFSC**.

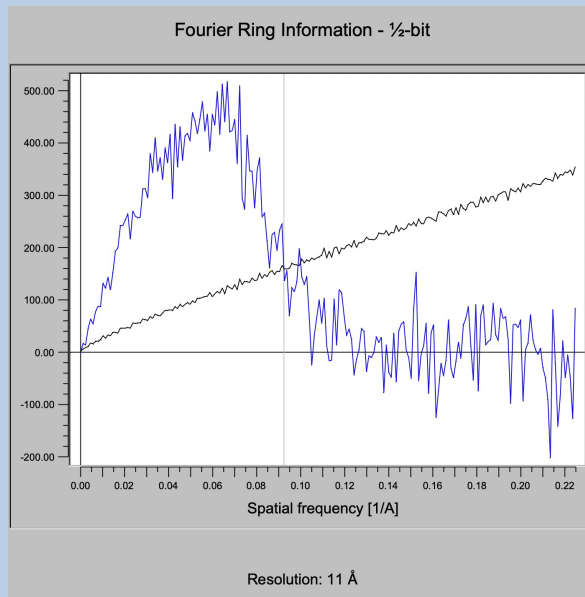


Clicking the “Run” button will start the calculations.

As usual the input images and the resulting information and/or resolution curves are displayed in the display/plot tabs on the right-hand side.

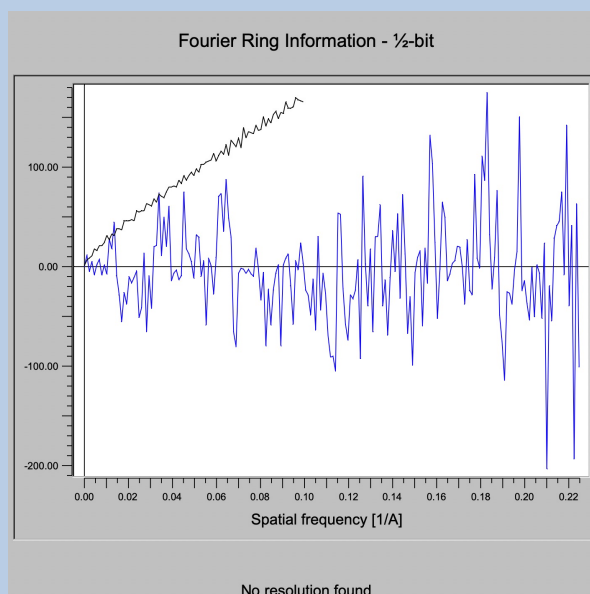


In contrast to the FRC/FSC curve the FRI/FSI plots also show the estimated resolution value in case FRI/FSI curve and the ½-bit threshold curve intersect:



The ½-bit information curve indicates where a sufficient amount of data is collected to allow a direct interpretation at that resolution level. The overall resolution achieved is estimated by the intersection of the FRI/FSI curve (blue) and the 1/2 Bit curve (black).

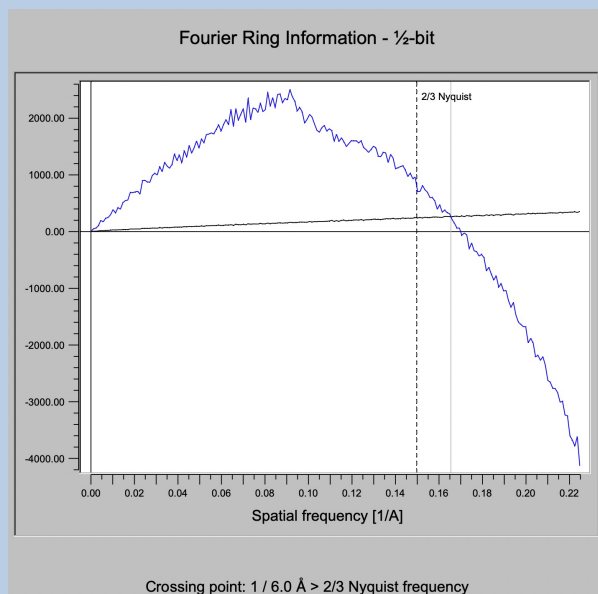
No resolution is printed if the estimated resolution value is too small :



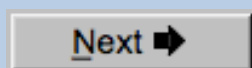
No resolution but a warning is printed if the estimated resolution value is too small or too close to the Nyquist frequency.

PLEASE NOTE:

Under-sampling remains one of the worst sins one can commit in estimating the resolution / information content in images / 3D volumes. You should never claim any resolution level beyond 2/3rd of the Nyquist frequency.



As usual you can click the “Next” button to navigate to the next page which is the “Local Information / Resolution” page.

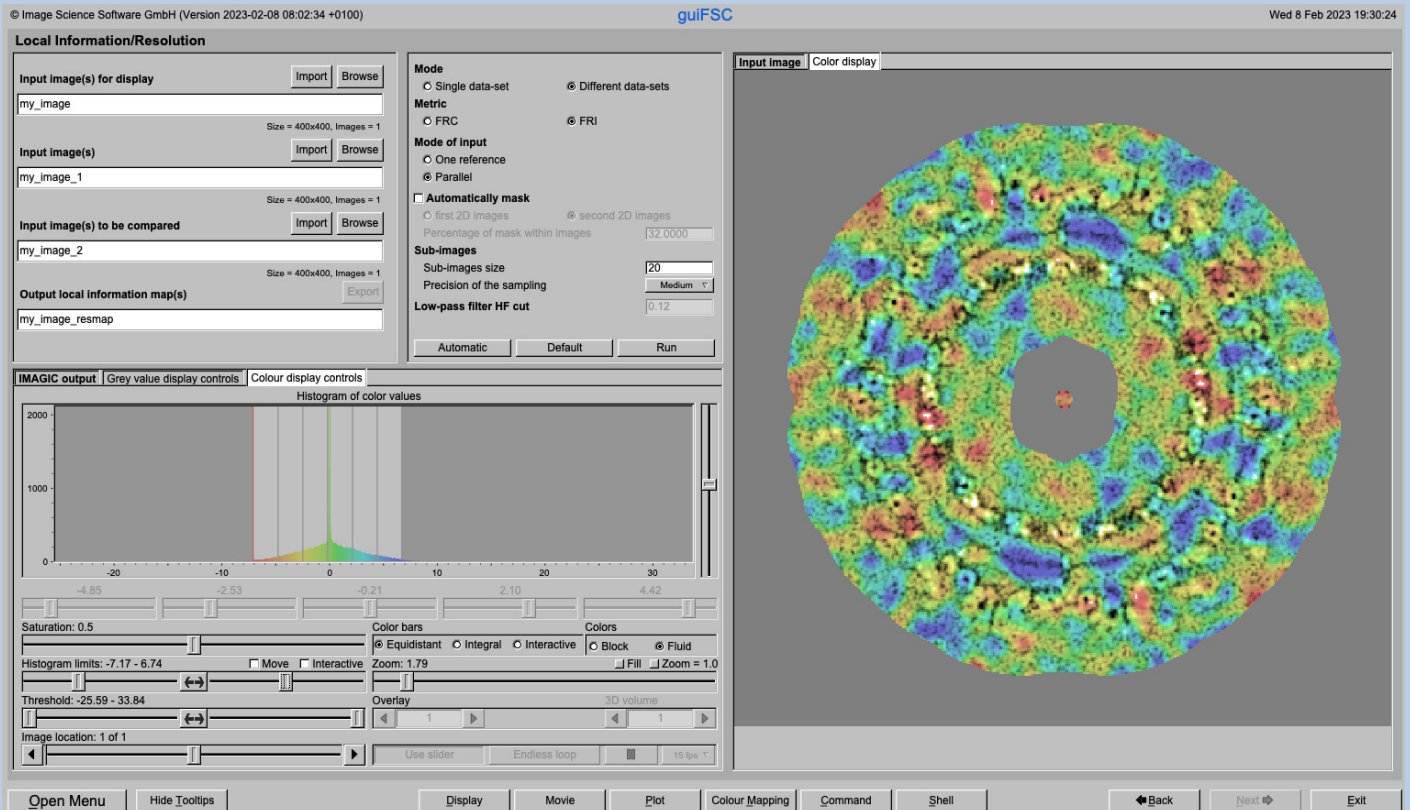


Note:

Global information/resolution was described for images. But input can also be curves/spectra/1D image or 3D volume(s) files. In this case the pages are modified for the other dimension but the content and the use of the pages are the same or similar.



The “Local Information/Resolution” Page



DESCRIPTION:

Calculate the local information content (using the Fourier Ring or Shell Information metric (FRI/FSI) and/or the local resolution (using the Fourier Ring or Shell Correlation metric (FRC/FSC)).

The comparison(s) can be calculated between different images / 3D volumes or by comparing each image / 3D volume with itself.



Specify if input are two different or a single data-set. Note that these two different option are not relevant for the calculations but to give better help and tool tips.

Mode

- Single data-set Different data-sets

In “Single data-set” you have to choose which of the following input modes is to be used

Mode of input

- One reference Sequential
 Parallel Sequential pairs
 Self

in “Different data-set” the input mode can be one of the following:

Mode of input

- One reference
 Parallel

Modes of input are:

➤ One reference:

The input images / 3D volumes are compared with a single reference

Input image(s) to be compared	Import	Browse
my_images		
Size = 400x400		
Reference image	Import	Browse
my_reference		



➤ Parallel:

The images / 3D volumes in the first input file 1 are compared one-by-one with the images / 3D volumes in the second input file. Both input files are expected to contain the same number of images / 3D volumes.

Input 1st half data-set 3D volume(s) Import Browse
my_images_1
Size = 400x400
Input 2nd half data-set 3D volume(s) Import Browse
my_images_2
Size = 400x400

➤ Sequential:

The images / 3D volumes to be compared are stored in a single input file. The comparison is in sequential order which means The image / 3D volume #1 is compared with #2, #2 with #3 etc.

Input images to be compared Import Browse
my_images
Size = 400x400

➤ Sequential pairs

Same as sequential but the comparison is done pair-wise: The image / 3D volume #1 is compared with #2, #3 with #4, #5 with #6 etc.

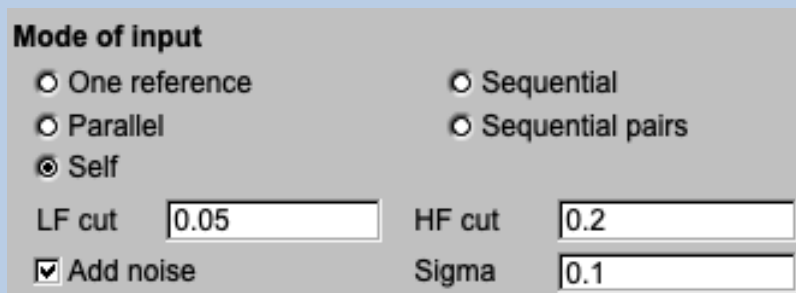
➤ Self

In case of a “Single dataset” there is an additional mode of input option “Self” which allow to calculate the information content/resolution using single images / 3D volumes which are only compared with itself but NOT with any other images / 3D volumes.

Input image(s) Import Browse
my_image
Size = 400x400



Note that in case of option “Self” you have to specify the parameters of a band-pass filter and you can add noise to to remove high frequency information introduced by this very specific “self compare” technique:



Mode of input

One reference Sequential

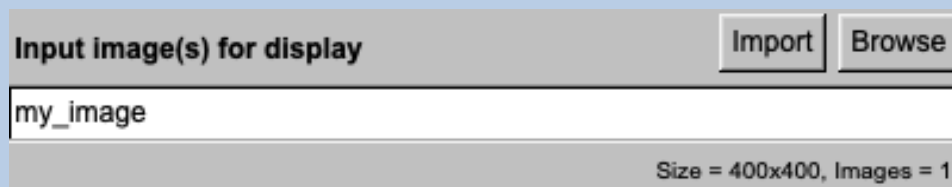
Parallel Sequential pairs

Self

LF cut HF cut

Add noise Sigma

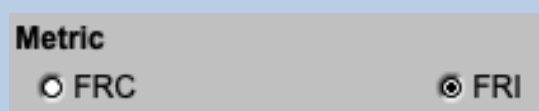
The first input file which name you have to specify is asked for all option. It is NOT needed for the information/resolution calculations. It is only needed in the COLOURISED DISPLAY where it is used as grey-image which is colourised by the calculated information/resolution map. So this image / 3D volume usually is a sum of the input images compared are the full resolution 3D volume in case an odd and even 3D reconstruction is used. When using the “Self” comparison mode this input file is usually the same as the input file to be used for comparison.



Input image(s) for display

Size = 400x400, Images = 1

Next you are expected to choose the wanted metric:



Metric

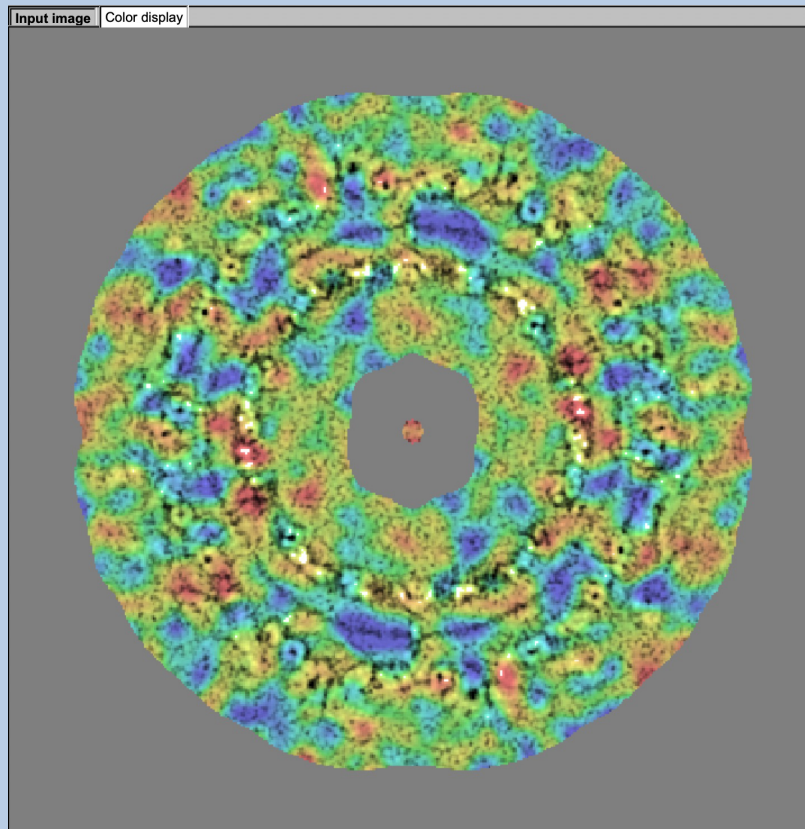
FRC FRI

Options are:

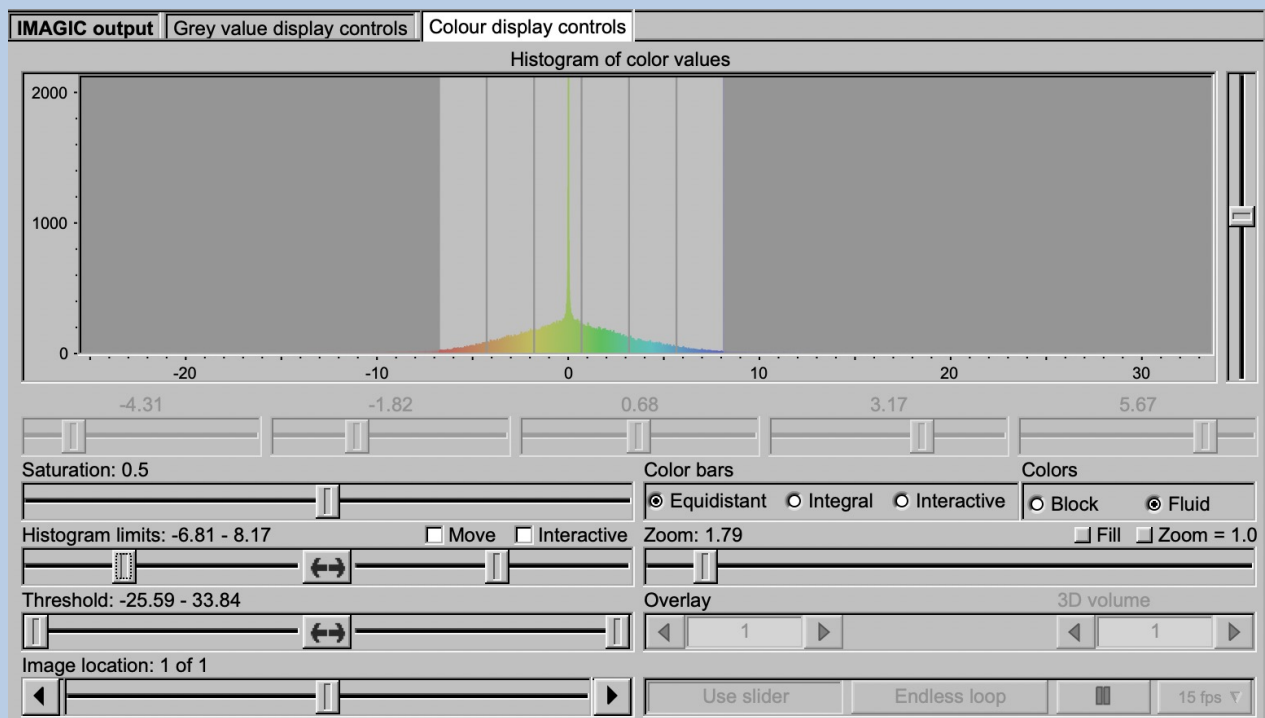
Images FRC Global resolution using the
Fourier Ring Correlation

 FRI Global information using the
Fourier Ring Information

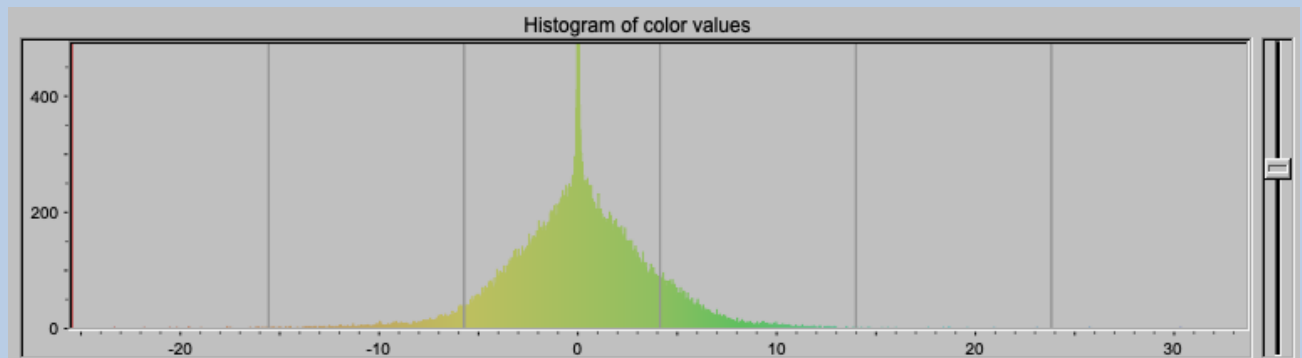




Use the “Colour display controls” to adjust the coloured display on the right-hand side.



The histogram shown in the “Colour display controls” is the histogram of colour values used.



Use the slider to adjust the vertical scaling of the histogram.

The colour mapping can be adjusted by a number of parameters and options. Refer to the “**guiColourMapping** manual” for details.

- | | |
|-------------------|--|
| Saturation: | Adjust the saturation |
| Histogram limits: | Use the two sliders to adjust between which values the colour palette is used.
Interactive: Set the limits by giving numbers
Move: Move the chosen limits through the palette |
| Colour bars | How to use the colour palette
Equidistant: The colour palette is used linearly
Integral: The colour palette is squeezed according to the number of histogram values
Interactive: Use the histogram sliders to set the colour bars |
| Colours: | Block: Fixed colour between two colour bars
Fluid: The colours are changing continuously |
| Zoom | Enlarge the displayed image using the slider
Fill: Fit image size to window size
Zoom = 1.0. Display image 1:1 |
| Threshold: | Adjust the threshold limits with the two sliders.
Colours below the threshold are displayed in grey, colours above the threshold are displayed white |
| Image Locations. | Use the slider or the arrows to select image locations |



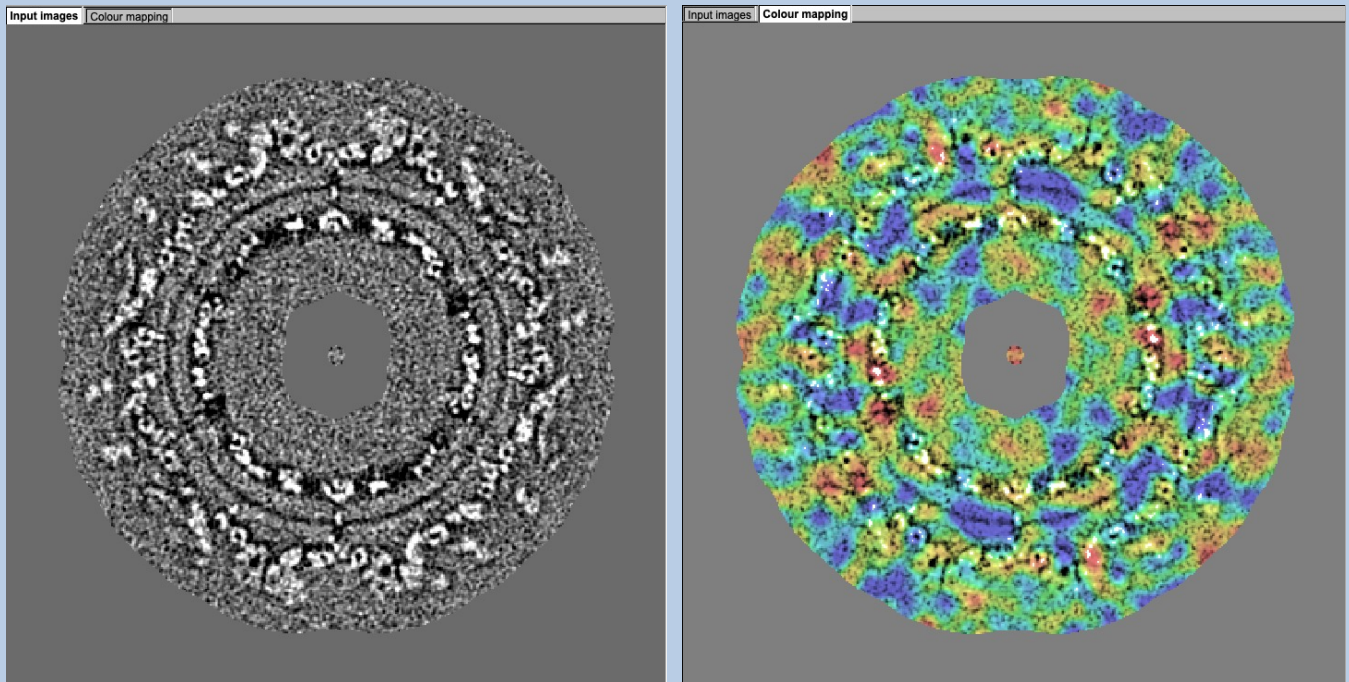
COMPARE TWO DIFFERENT LOCAL INFORMATION / RESOLUTION MAPS:

Note that the value of each colour is an absolute value. If you want to compare different information / resolution maps make sure that the same "Histogram limits" are used. Activate the "Interactive" option and specify the same limits in both colourised displays for a correct comparison.


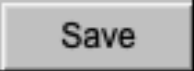
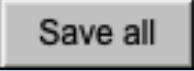


Display Windows

The image(s) are displayed in the display windows at the right hand side. Click the related tab to get the wanted display window.



Moving the cursor into the display window there are a few options:

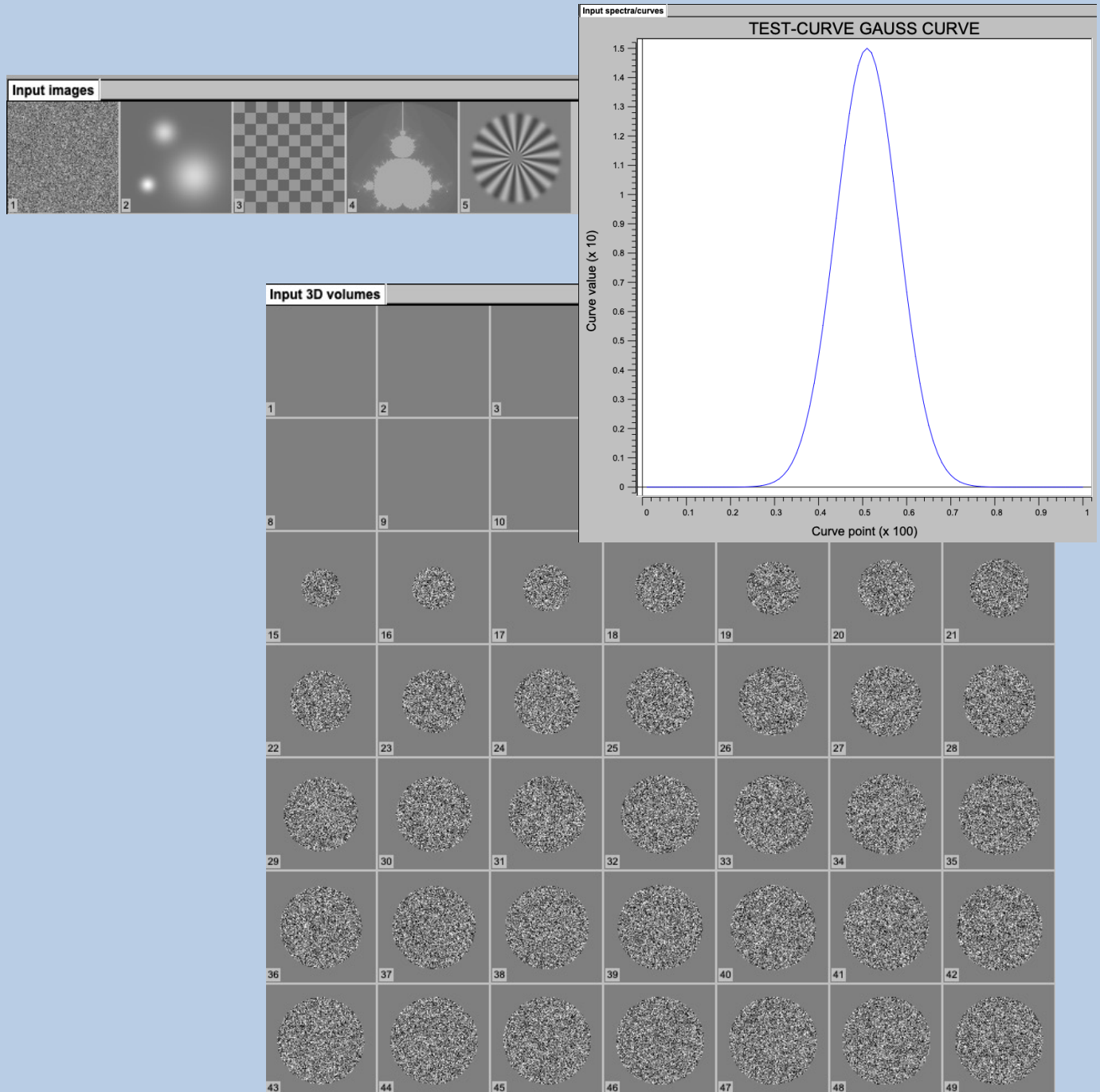
- | | |
|---|--|
|  | Open the display window a larger separate display window |
|  | Save the current displayed image in a JPG image |
|  | Save the whole window in a JPG image |

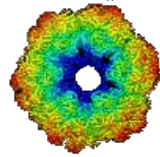


Dimensions

In the previous pages **guiFSC** was described for images.

But input can also be curves/spectra/1D image or 3D volume(s) files for global information/resolution and 3D volumes for local information/resolution. In these cases the pages are modified for the other dimension but the content and the use of the pages are the same or similar.





IMAGIC

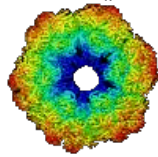
guiFSC

Not (yet) possible

The following options are not (yet) possible:

- Run in batch mode.
- Store output files and results of different pages in different sub-directories of the working directory.





IMAGIC

guiFSC

Feedback / Error hints

We intensively tested the **guiFSC** program and tried to find all possible errors and inconsistencies. But the program is very complex and still in progress. So you may still find some problems.

We are happy to get feed-back. Please send your comments, error hints etc. to

imagic@ImageScience.de

THANK YOU VERY MUCH.



Image Science

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