

LATERAL RESOLVING POWER PROCEDURE FOR ACQUISITION AND ANALYSIS

A. Image acquisition

The lateral resolving power analysis is associated to the patterns “gradually spaces lines” (cf. Figure 1).

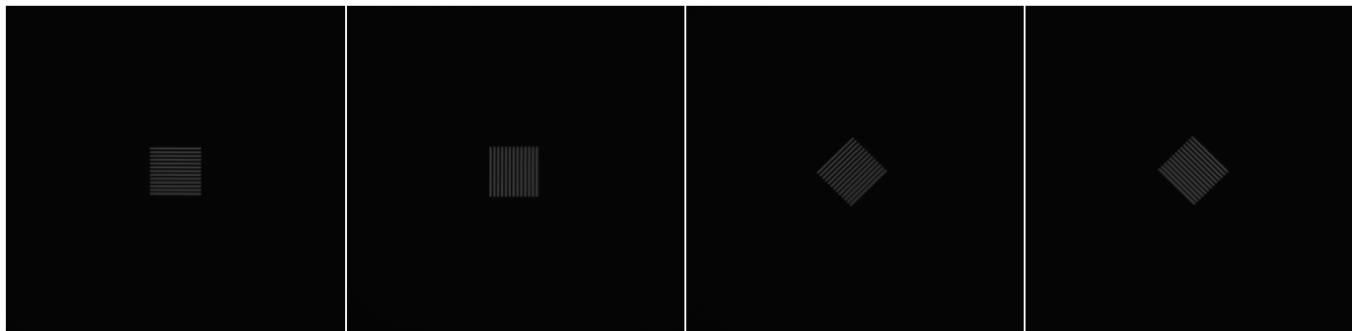


Figure 1: Images example of the 4 gradually spaced lines patterns (horizontal, vertical, +45° and -45° lines), fulfilling the acquisition recommendations.

To acquire images of these patterns:

- 1) Match the center of the pattern with the center of the field of view.
- 2) Adjust the focusing. If needed, zoom in to be more precise. The best focus usually corresponds to the broadest image histogram.

Recommendations:

- When possible and before the acquisition, align precisely the sensor orientation or the scanning with respect to the lateral stages. The analysis however corrects itself for a low (a few degrees) XY orientation misalignment.

- Acquire images with enough contrast between the field of rings and the background, *i.e.* a signal to background ratio (SBR) higher than 2. Be careful not to saturate the image.

- Acquire images with an optimal resolution (2048 × 2048) and dynamics (8, 12 or 16 bits).

Note that if the image is too big for the computational capacity of your computer, the analysis may not succeed.

B. Analysis procedure

1. Select “Lateral resolving power” in the “Select analysis” list.
2. Select the image to be analyzed. It is possible to import the lateral pixel size from the source proprietary file. You can also get the pixel size from the analysis by selecting the “computed from the test” option before or after the illumination inhomogeneity test (it also works with the distortion test).
3. Set the pixel size, the contrast criterion (in %) above which two lines are distinguished, the ROI width and the interpolation factor.

Important note: the algorithm used to extract the lateral resolving power in Daybook provides accurate measurements for contrast criteria set above 26.5% (this value corresponds to the Rayleigh criterion). Below this value, the algorithm becomes more and more inaccurate as the contrast criterion gets closer to 0%.

- Optional: To correct the orientation of the pattern, click on the “Apply an orientation correction” radio box. The correction angle is computed from other tests (lateral resolving power test, or distortion field test) or fixed manually.

Optional settings

Apply an orientation correction

Correction angle (°)

computed from the last test

- To proceed, click on “Start the analysis”.

Lateral resolving power **Start the analysis** Normalized image On/Off

- If needed, select a region of interest (ROI) and click on “Crop” to crop the image (*cf.* Figure 2).

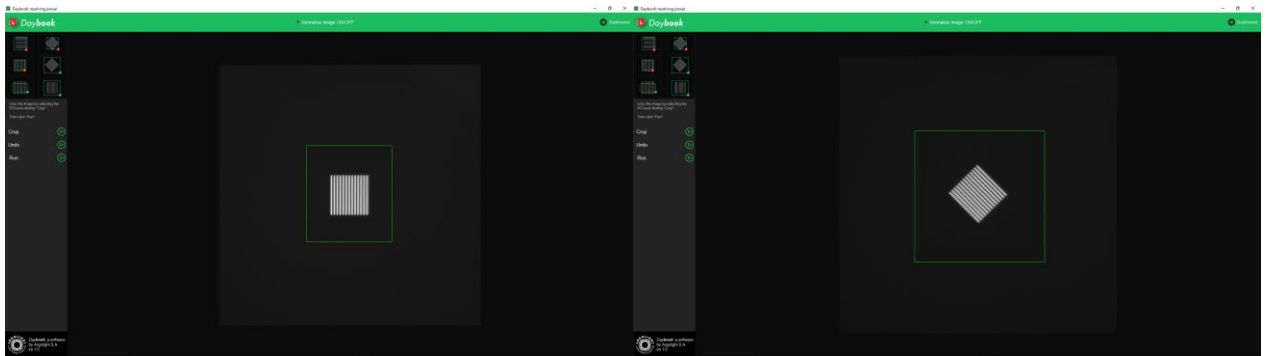


Figure 2: Cropping interface windows.

- Click on “Run” to run the analysis.
- Results are displayed and can be saved.

Note that the ROI width has a huge influence on whether the analysis works or not. When the ROI width is too small, the peaks and valleys detection does not work precisely. Here are two examples to illustrate this effect:

- Bad detection with the ROI width set at 50 pixels (*cf.* Figure 3):

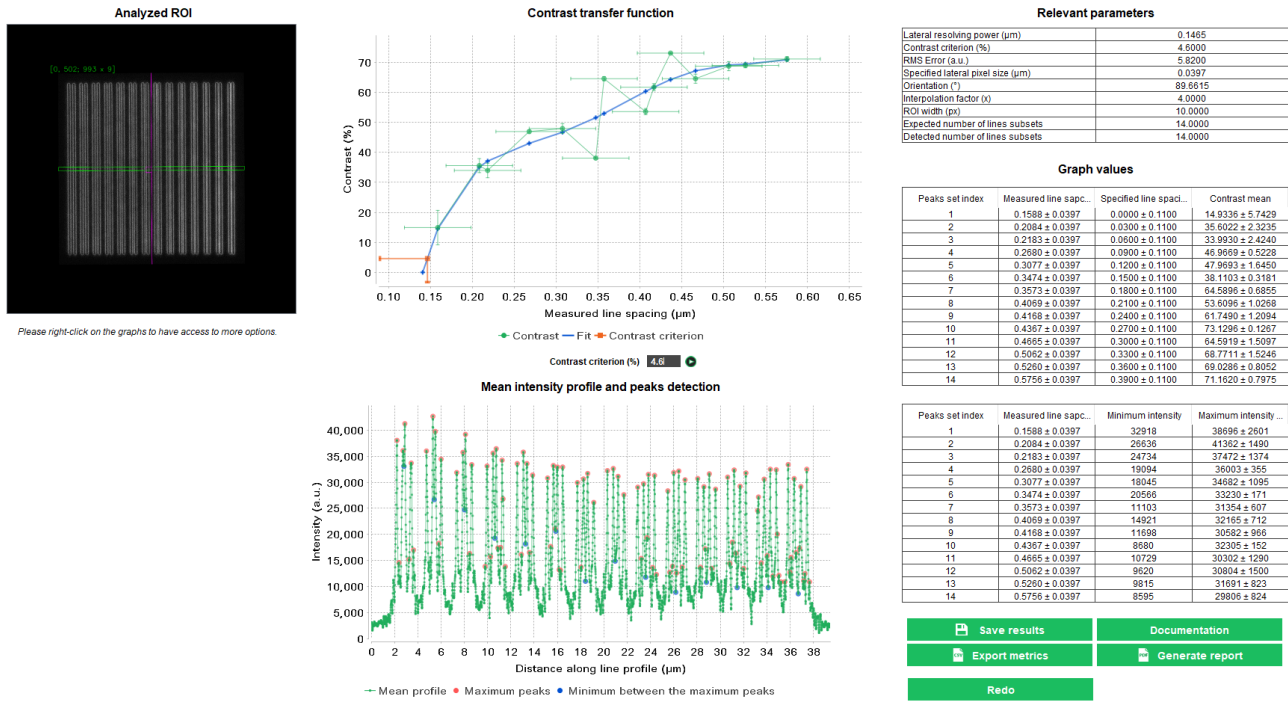


Figure 3: Bad detection of the peaks and valleys due to a too small ROI width, resulting in a “noisy” contrast transfer function.

- Good detection with the ROI width set at 200 pixels (cf. Figure 4):

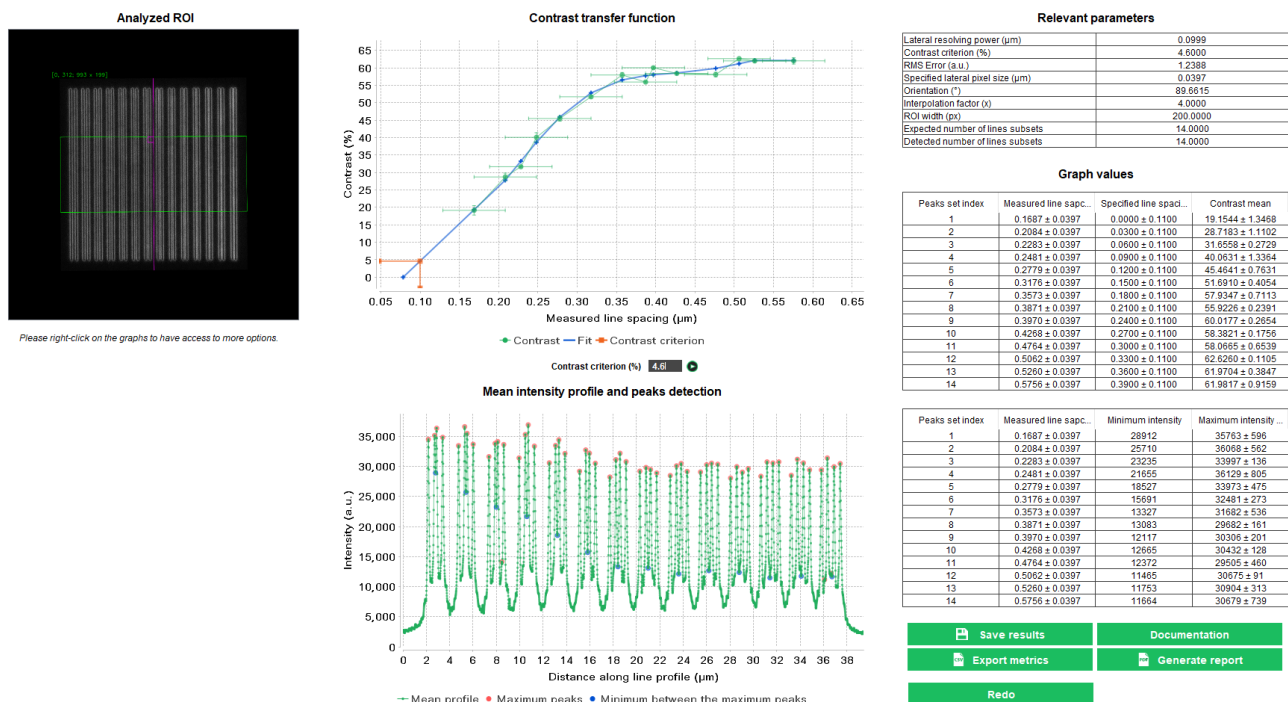


Figure 4: Good detection of the peaks and valleys due to an appropriate ROI width, resulting in a “smooth” contrast transfer function.

Click on “Redo” to easily change the ROI width, correction angle, pixel size and re-run the analysis with another ROI width.

C. Results

The picture below shows the results interface for this analysis. Useful information can be found in the displayed maps, graphs and tables (cf. Figure 5).

Analyzed profile ROI

Contrast transfer function:
Contrast vs. spacing

Parameters calculated by
the analysis

Change the contrast criterion + Enter to recalculate the resolving power

Peaks and valleys detection superimposed on the intensity profile

Save results

Details of the calculation formula and analysis workflow

Redo the test

Figure 5: Results interface window.