

## INTENSITY RESPONSE ANALYSIS PROCEDURE

### A. Image acquisition

- 1) To compare intensity response, set the excitation wavelength, excitation power, exposure time and/or sensor gain.
- 2) Place the 4x4 (or 2x16) intensity gradation pattern at the center of the field. We advise to use a reference point to be able to reproduce this position later.
- 3) 16-bits images are recommended (or 8-bits if need be). When setting the focus, make sure the pattern lines are as distinct as possible.
- 4) Optimize the alignment of the XY sensor orientation with respect to the stages, when possible.

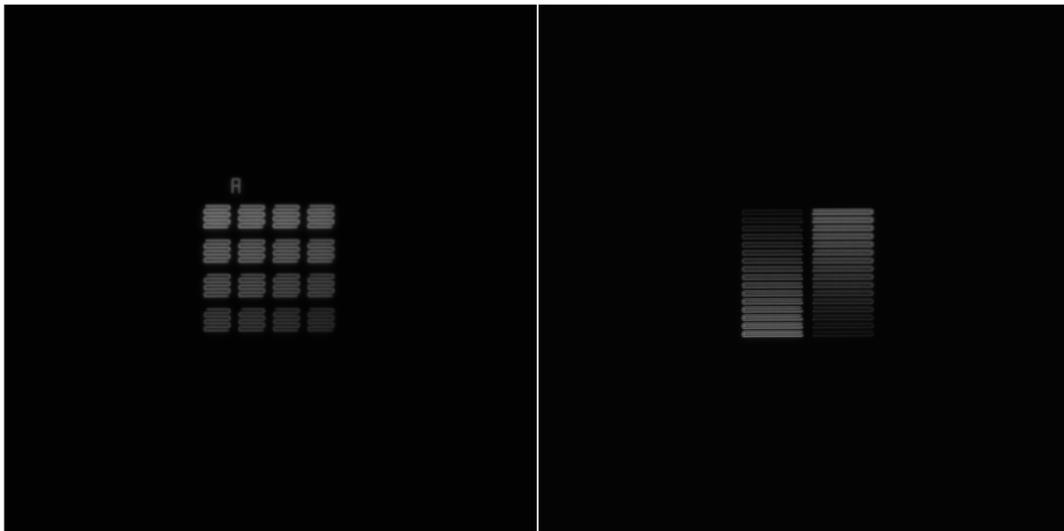
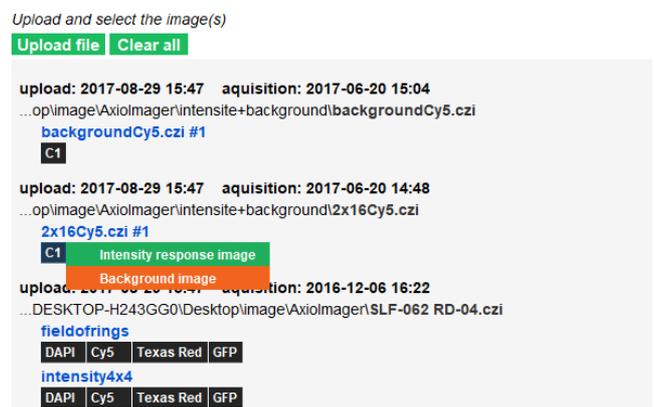


Figure 1: Example of intensity gradation pattern images. Left : 4x4 gradation. Right : 2x16 gradation.

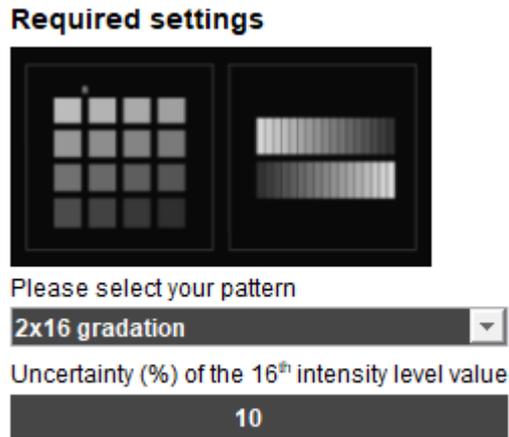
### B. Daybook 1.2 analysis procedure

1. Select “Intensity response” in the list of analysis.
2. Select an image of the intensity response pattern.

Figure 2 (on the right): Selection of the image for intensity response. The button appears in green after being selected as intensity response image. The button appears in orange after being selected as background image.



3. Choose the pattern to be analyzed:
  - 4x4 gradation (auto).
  - 4x4 gradation (manual): advised for images with noise.
  - 2x16 gradation (auto).



The measurement uncertainty of the intensity levels can be specified. By default, it is set on 10% of the 16<sup>th</sup> level: 5% from the slide, and 5 % from our own inspection imaging system.

If your imaging system’s error is estimated to be more than 5% (due to shading effects, sensor’s linearity, etc.), we advise to manually change this value.

4. Optional: The background signal can be corrected with another background image.

To do so, you can check the radio box and select an image of an empty area of the Argolight slide, with the same acquisition parameters. No patterns should be displayed on the image.

The image dynamic and resolution should be identical to the original image.

#### Optional settings

- Apply a background correction from an image of dark noise
- Apply an orientation correction

Correction angle (°)

-0.0063  
computed from the last test

5. Optional: To correct for the orientation of the pattern, click on the “Apply orientation correction” radio box.

The correction angle is computed from other tests (horizontal lateral resolving power test, or distortion field test) or set manually.

#### Optional settings

- Apply a background correction from an image of dark noise
- Apply an orientation correction

Correction angle (°)

-0.0063  
computed from the last test

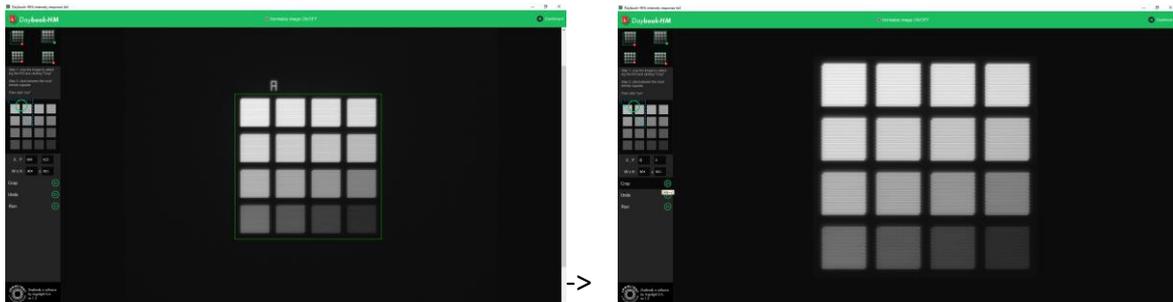
6. Start the procedure of the intensity response:

- o Scenario 1: 4×4 gradation (auto).

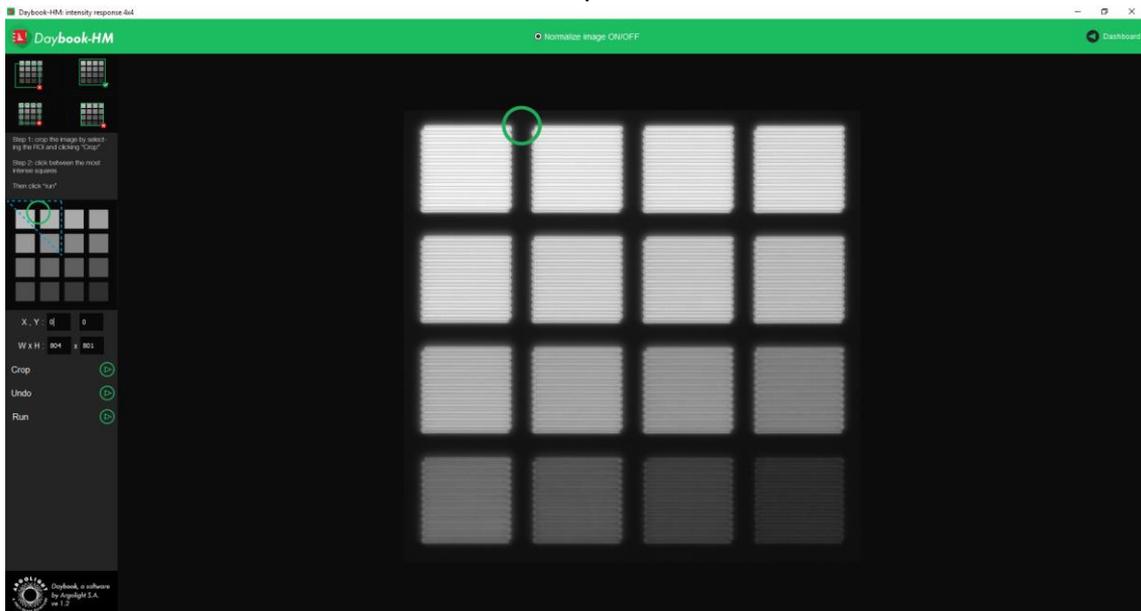
Use the crop tool (left click to trace the crop area), to display the desired pattern only.

- o Scenario 2: 4×4 gradation (manual).

Use the crop tool (left click to trace the crop area), to display the desired pattern only.



Left click on the most intense area to place the round landmark.



- o Scenario 3: 2×16 gradation.

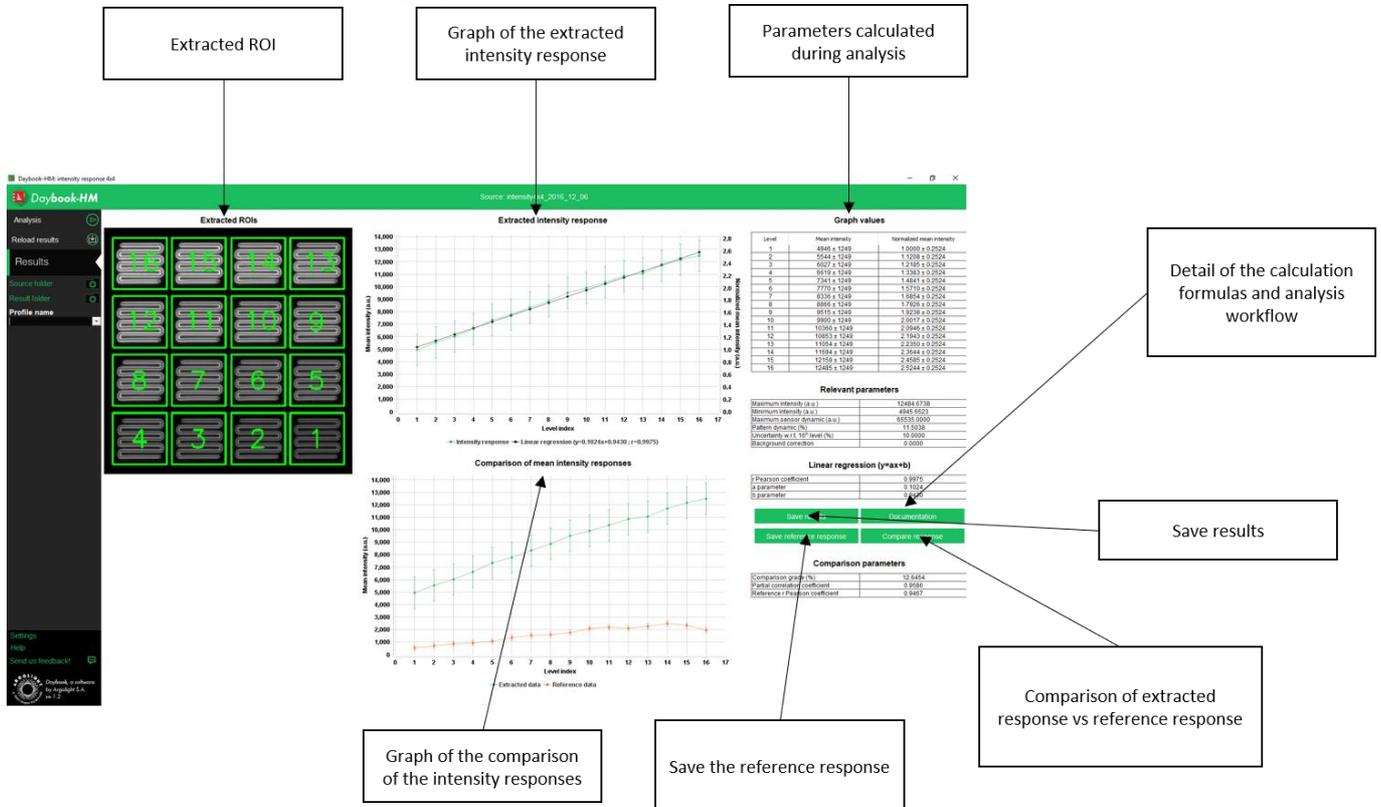
Use the crop tool (left click to trace the crop area), to display the desired pattern only.

7. Click on “Run” to run the analysis.

8. Results are displayed and can be saved.

## C. Results

The picture below shows the results interface for this analysis, and useful information about the different displayed maps, graphs and tables.



The screenshot displays the Daybook-HM software interface with the following components and callouts:

- Extracted ROI:** A grid of 12 small images showing extracted regions of interest, numbered 1 through 12.
- Graph of the extracted intensity response:** A line graph showing Mean Intensity (k.u.) on the y-axis (0 to 14,000) versus Level index on the x-axis (0 to 17). A linear regression line is fitted to the data points.
- Parameters calculated during analysis:** A table titled "Graph values" showing Mean intensity and Normalized mean intensity for levels 1 through 16. Below it, a table of "Relevant parameters" including Maximum intensity (k.u.), Minimum intensity (k.u.), Maximum sensor dynamic (k.u.), Pattern dynamic (%), Overexposure at 1% level (%), and Background correction.
- Comparison of mean intensity responses:** A graph comparing the extracted response (blue line) with a reference response (orange line) against Level index.
- Save results:** A callout pointing to the "Save reference response" and "Compare response" buttons in the "Linear regression" section.
- Detail of the calculation formulas and analysis workflow:** A callout pointing to the "Linear regression (y=mx+b)" section, which displays the Pearson coefficient, a parameter, and a parameter.
- Comparison of extracted response vs reference response:** A callout pointing to the "Comparison parameters" table, which includes Comparison grade (%), Partial correlation coefficient, and Reference regression coefficient.

### Comparison of two intensity responses:

You can compare the extracted response to a reference response (provided a reference response has been previously saved). The “Compare response” button will compare your current result with the last reference response saved.

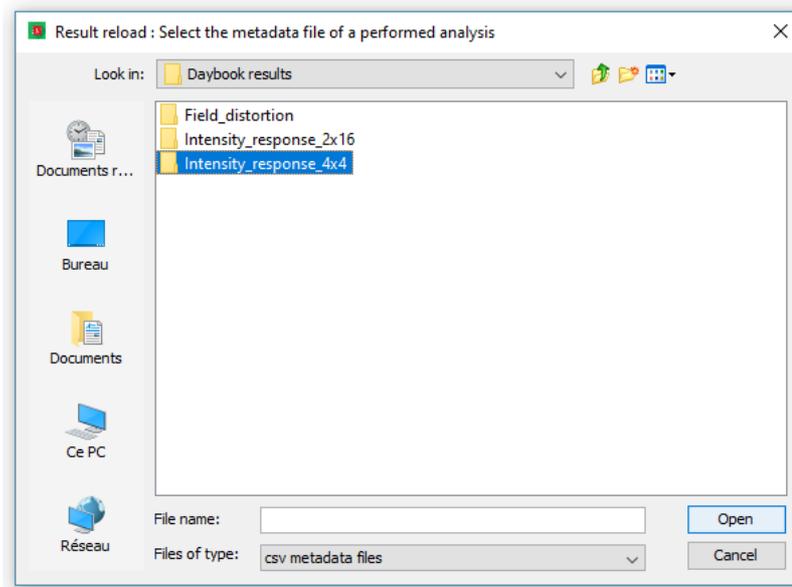
We advise to store the results from your intensity response tests. You will then be able to reuse a previous test as reference.

### How to use the results of previous test as “reference response”?

- It requires that the previous test results have been saved (using the “Save results” button).



- Click the “Reload results” button on the left-hand side and select an intensity response file (.csv file).



- Click the “Save reference response” button.

### Note:

- Only images with the same dynamic can be compared (8-bits or 16-bits).
- For the 2x16 gradation, the results given are the mean values of both responses. Individual values are available within the .csv file.
- A test previously run and stored can be loaded as a reference in the case of the intensity response test.
- The intensity response of the 2x16 and 4x4 gradation patterns have a different reference dynamic because i) the mean of the ROI depends on the pattern shape, and ii) the influence of the illumination inhomogeneity on these two patterns is different, resulting in different intensity evolutions.

