# IdPhO 2020 Experiment 1. Crystallography. Appendix

1. The experimental setup is simple: Laser beam is illuminating different diffraction gratings. The distance between the diffraction grating and the screen (where diffraction pattern is observed) is 1 m.

2. Resulting diffraction patterns from every grating were shot with a camera. See available files.

3. There are photos where a lot of spots are seen. These show general overview of the diffraction pattern.

4. There are photos where graph paper is seen. Use this to measure distances.

5. Finally, there are photos that are dark. Use these to measure spots intensities if you need.

6. Intensities are measured using ImageJ open-source software.

ImageJ instructions

1. Open an image file via menu `File > Open`

2. Go to menu `Analyze > Set measurements`

3. Make sure that the option `Integrated density` is checked and click `OK`
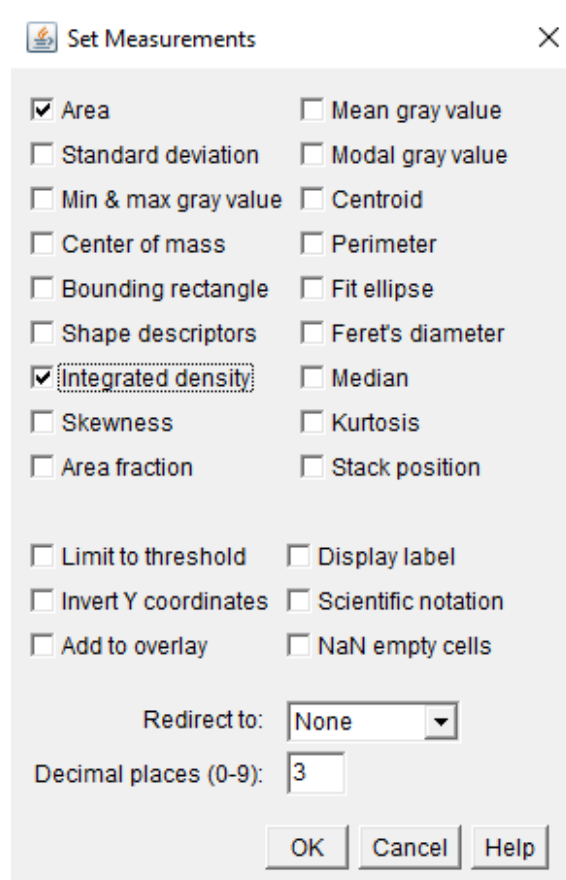
4. Select an area of interest on the image using one of the selection tools available.
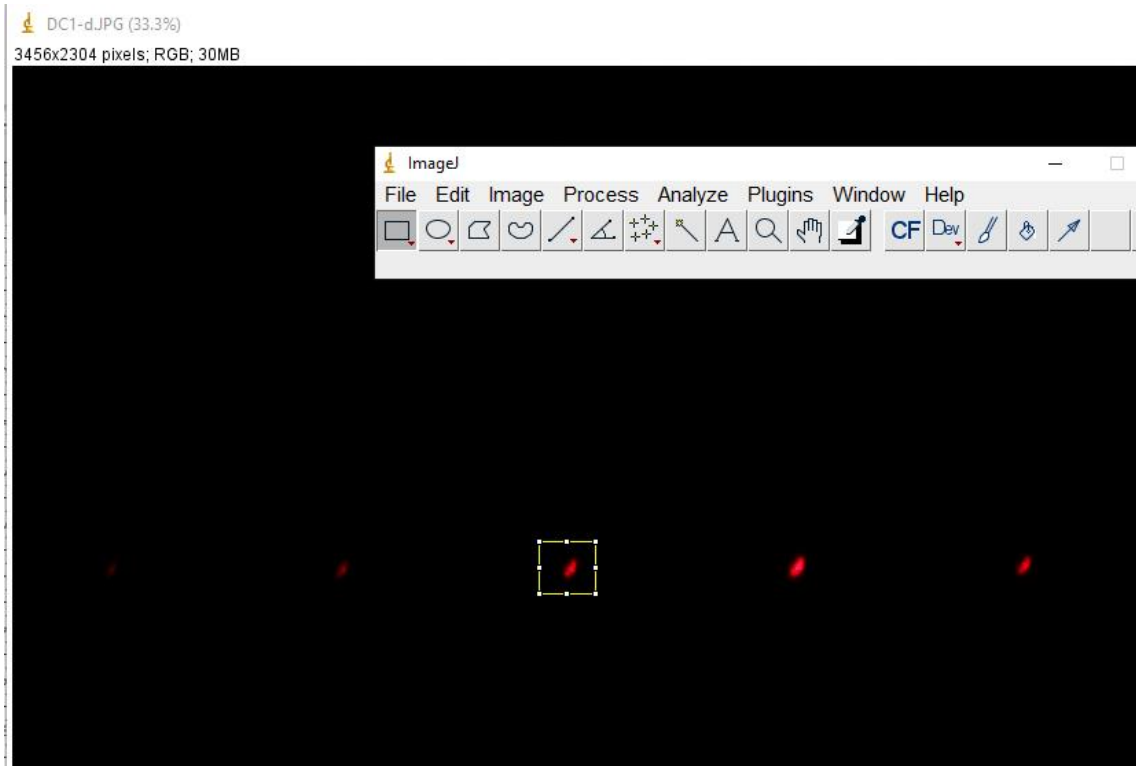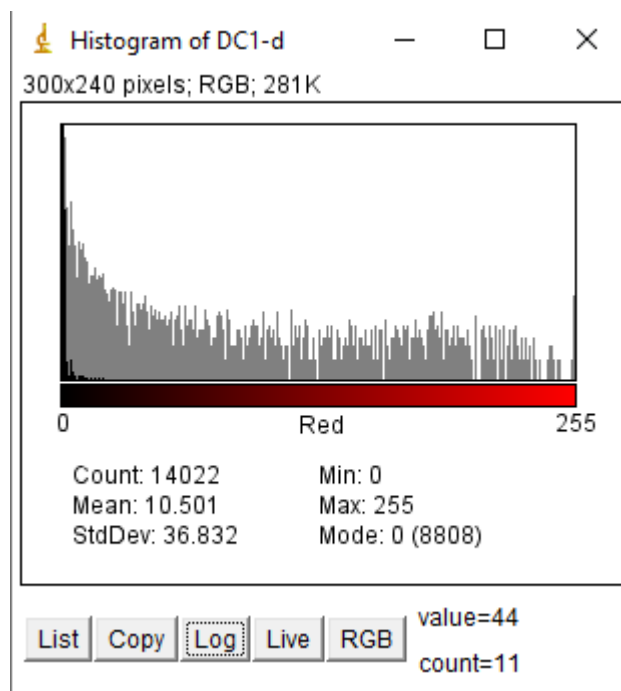

5. Choose `Analyze > Measure` to make the measurement. There is keyboard shortcut for measurement action. The Results window contains the results of the measurement.

6. You must be careful about that measured intensity in the `Results`.

7. It is known that the pixel color can be coded in Red-Green-Blue channels. The value of each color can take values from 0 to 255. Once each color channel value does not exceed 255, you can assume that the real intensity is proportional to the number you get in #5.

8. In case the settings or the matrix of the camera were sensitive enough the pixels can get saturated. I.e. the real intensity is no longer proportional to the value you measure in #5.

9. To be more confident about this you can apply `Analyze > Histogram` to the same area you have selected previously. Press several times `RGB` button to get to the Red channel distribution. And switch to `Log` mode in the same window.

Histogram of DC1-d

300x240 pixels; RGB; 281K

Count: 14022	Min: 0
Mean: 10.501	Max: 255
StdDev: 36.832	Mode: 0 (8808)

List Copy Log Live RGB

value=44
count=11

10. Statistics shows that there are some saturated pixels (=255). But their amount is quite low, as can be seen in logarithmic scale. For this spot we can most probably ignore this saturation and consider the real intensity to be proportional to the measured one.

11. Intuitive rule you may use: pink spots have high number of saturated pixels (because they are a mix of red and white, and white is the saturation in all three color channels).

12. Do not forget about the background.