Documentation of DMD Widget

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Mask projection

1. Check the DMD connection switch in the **DMD mask projection** panel to see whether DMD has been connected on start-up. If not, connect the DMD.

2. First snap an image using full field of view illumination in order to select a region of interest. Press the **Snap FOV** button. Laser intensity should be set on beforehand in the **AOTF control** panel.
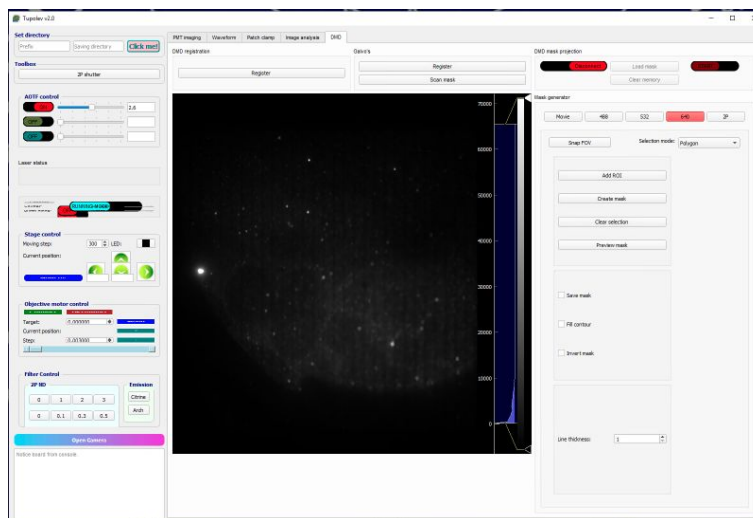

3. The application loads the registration settings from the latest registration procedure automatically on start-up. However, it is likely that registration needs to be done again in order to do accurate projections. Press the **Registration** button in the **DMD registration** panel. In the popup window, select the lasers that need to be registered and press **Start**. The **Registration** button will turn red for the time the registration procedure is running. Before starting the registration procedure, close the camera window in case it is open and stop running DMD projection.
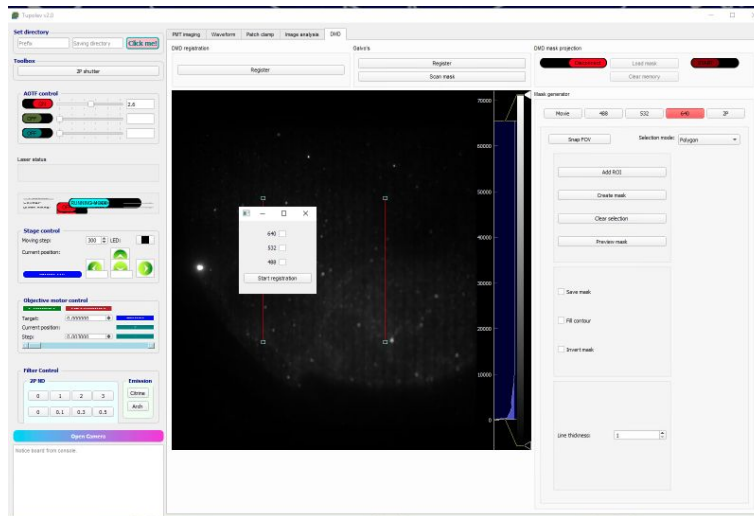
4. In the **Mask generator** panel, press the **488**, **532** or **640** button, correspondingly to the laser that is to be used. Select the selection mode in the drop down menu.

    a. **Polygon selection**

- Press the **Add ROI** button to add a selection box to the image window.
- Handle the selection box to wishes, adding more than one is possible. Remove selection boxes by pressing the **Clear selection** button.
- Adjust the settings.

        I. Check the **Save mask** box to save the mask. Naming is based on date and time.

        II. Check the **Fill contour** box to fill the contour in the binary mask.

        III. Check the **Invert mask** box in order to invert the binary mask.

        IV. Use the **Line thickness** setting to determine the thickness of the contour. Line thickness is not being used when **Fill contour** is checked.

- Press the **Create mask** button. Check the resulting mask by pressing the **Mask preview** button, which will open a popup window showing the binary mask.
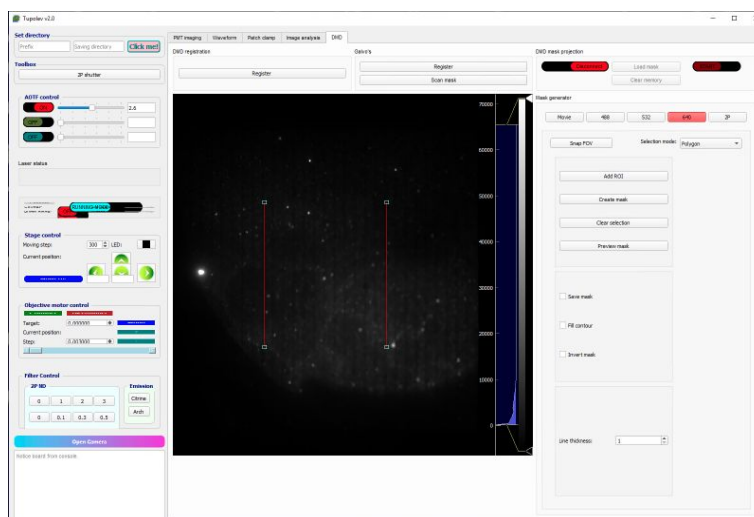
    b. **Freehand selection**

- Press once in the image window to activate freehand drawing. Draw a mask and press again to deactivate freehand drawing. Drawing multiple selections is possible. Scale and move selections.
- Adjust settings. See settings explanation under **Polygon selection**.
- Press the **Create mask** button. Check the resulting mask by pressing the **Mask preview** button, which will open a popup window showing the binary mask.
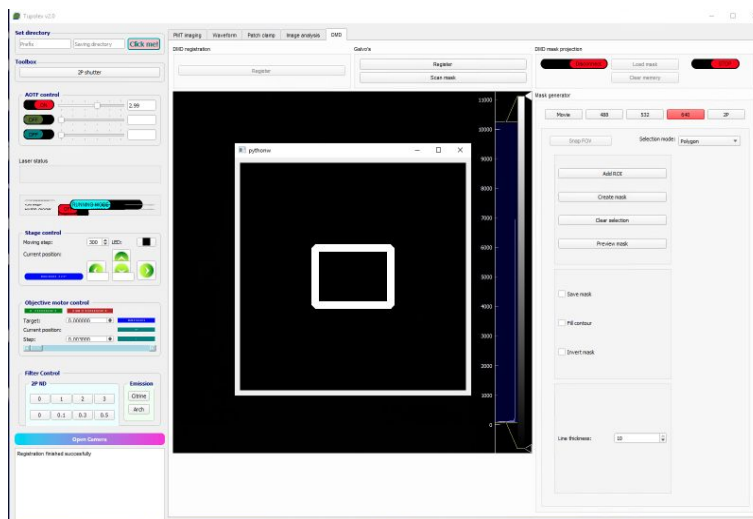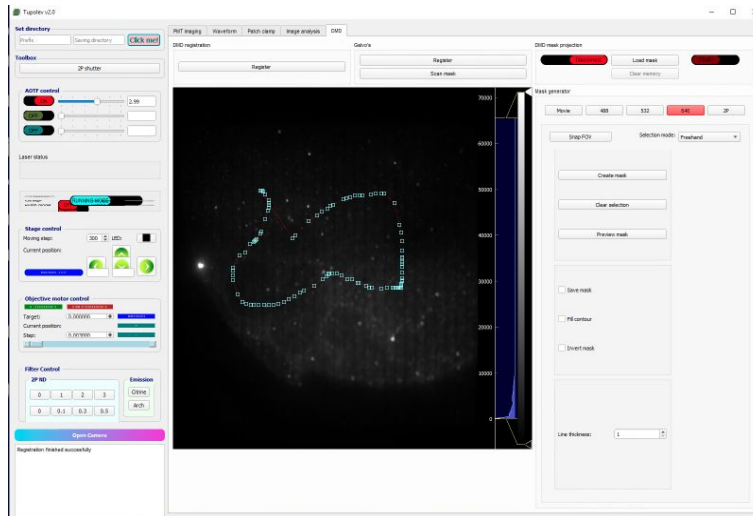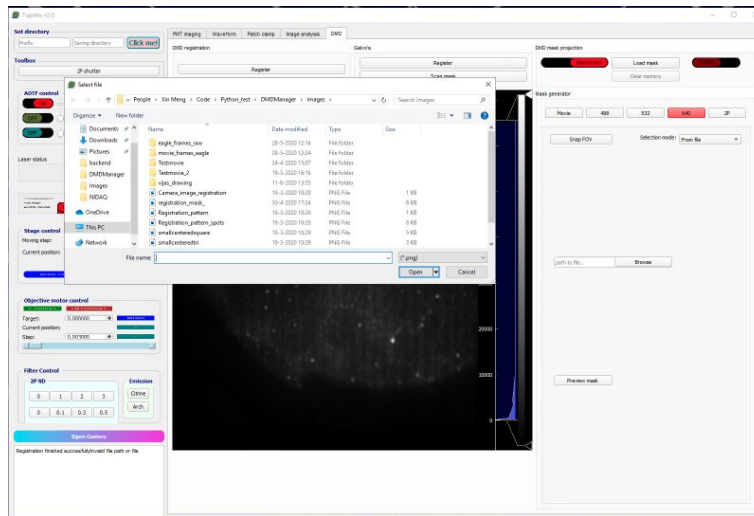

c. **From file**

- Press **Browse** to open the file manager or provide a file path. Press **the Preview mask** button to see the binary mask. The image should have dimensions 768 x 1024 or 1024 x 768, which is the DMD resolution and be binary. When the image is a stack, e.g. RGB, a max projection of the image is used.

5. After pressing the **Create mask** button, load the mask to the DMD by pressing **Load mask** in the **DMD mask projection** panel. In order to load a mask, the DMD should not be projecting and the memory should be emptied.
6. Start DMD projection by moving the **Start** switch. DMD projection is stopped by moving the same switch to **Stop**.
7. Check the resulting projection in the camera window. The projection is visible in live mode. When the **Snap** button is pressed, the snapped image is added to the image window in the DMD tab, so that the selection overlays the projection. Check the correspondence between selection and resulting projection. In case of poor correspondence, registration values are not accurate so registration needs to be performed.
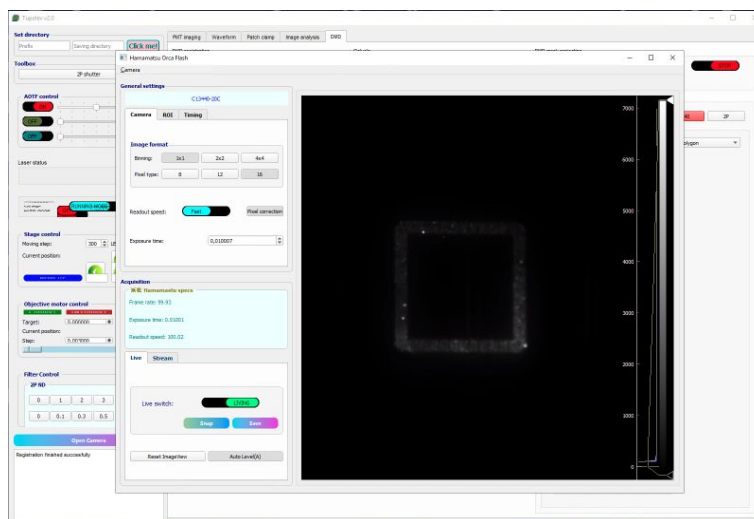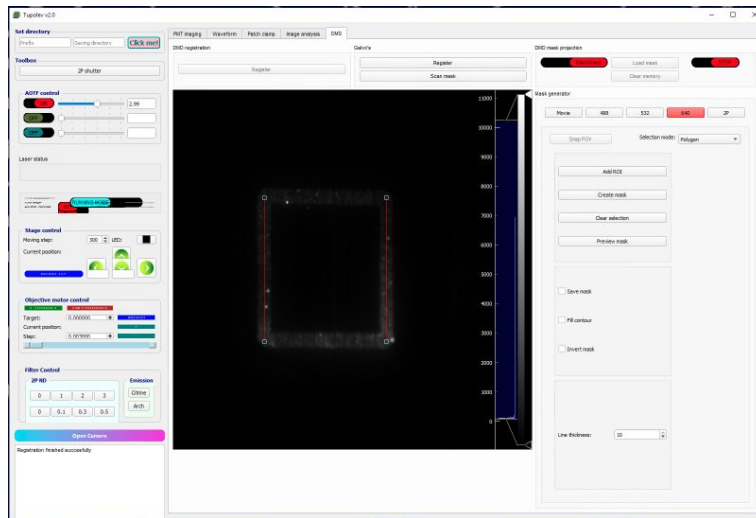
Movie projection

1. Check the DMD connection switch in the **DMD mask projection** panel to see whether DMD has been connected on start-up. If not, connect the DMD.
2. In the **Mask generator** panel, press the **Movie** button. Press the **Browse** button or provide a folder path to a folder containing movie frames. The movie frames should have dimension 768 x 1024 or 1024 x 768 and be binary. If the frames are not binary, a max projection is used. Press the **Load movie** button in order to read the image files. This may take a few seconds, depending on the number of frames.
3. Check the **Invert** button in order to invert the binary frames.
4. Provide a period, which is the frame duration, in µs.
5. Set the **Repeat** switch for continuously looping over the movie or one projection of the movie.
6. Press the **Load mask** button in the **DMD mask projection** panel. The DMD should not be projecting and memory should be empty. Move the **Start** switch to start projection. Use the **Live** mode in the camera window to see the result. Note that the resulting live image in the camera window might suffer from stuttering, this is likely due to the refreshing rate of the camera window. Solve the problem by turning of live mode and streaming the data to a file.