# OCT – Hands-on experimental setup

## I – Introduction

This short presentation document will cover the main features of the experimental apparatus, tuning modalities and directions for the application developed by the LEnsE laboratory. It will hopefully give you a comprehensive understanding of the setup and let you use it without struggle.

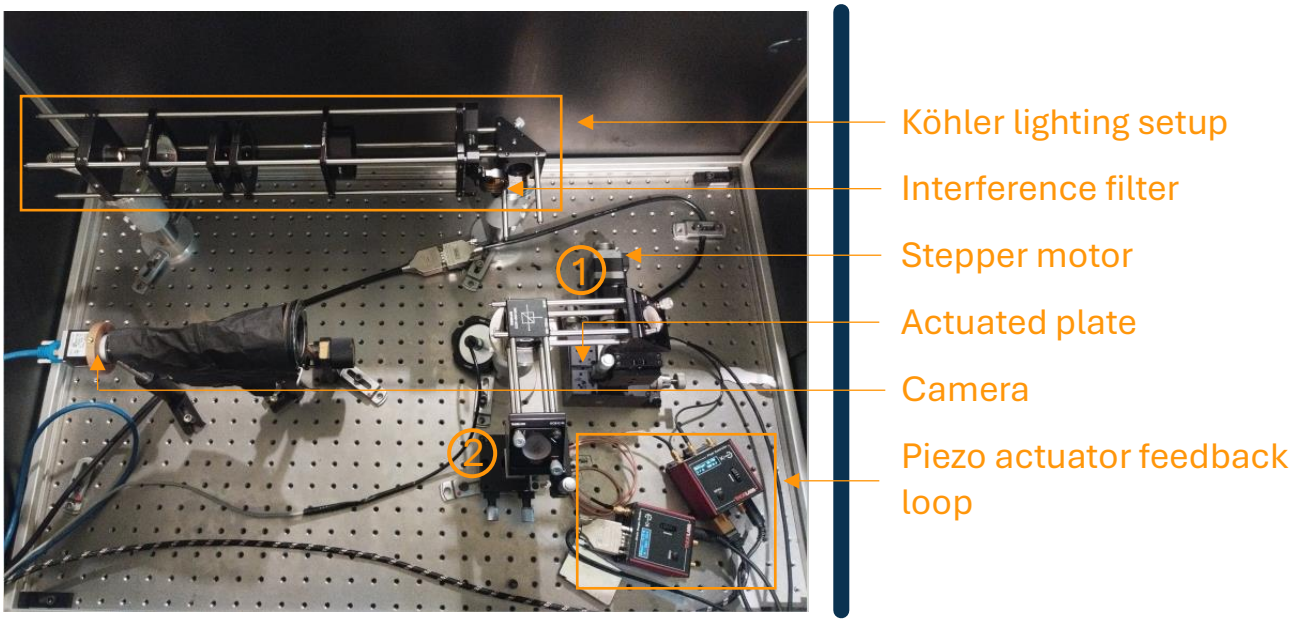
## II – Experimental setup

The apparatus is composed of a Köhler lighting setup, a Michelson interferometer and a camera. One arm of the interferometer images the sample of interest which is mounted on a motorized platform. The platform is moved by a stepper motor + piezo actuator ensemble that allows for fast movement as well as fine tuning.

The other arm ends on a mirror which height you can tune with the dedicated screw.

Beware, the setup has already been tuned: you should only have to use the motors on the first arm and the platform screw and microscope objective screw on the second arm to get a clear OCT signal. It is very improbable that anything else must be changed, and you risk losing the ability to carry on the experiment altogether.

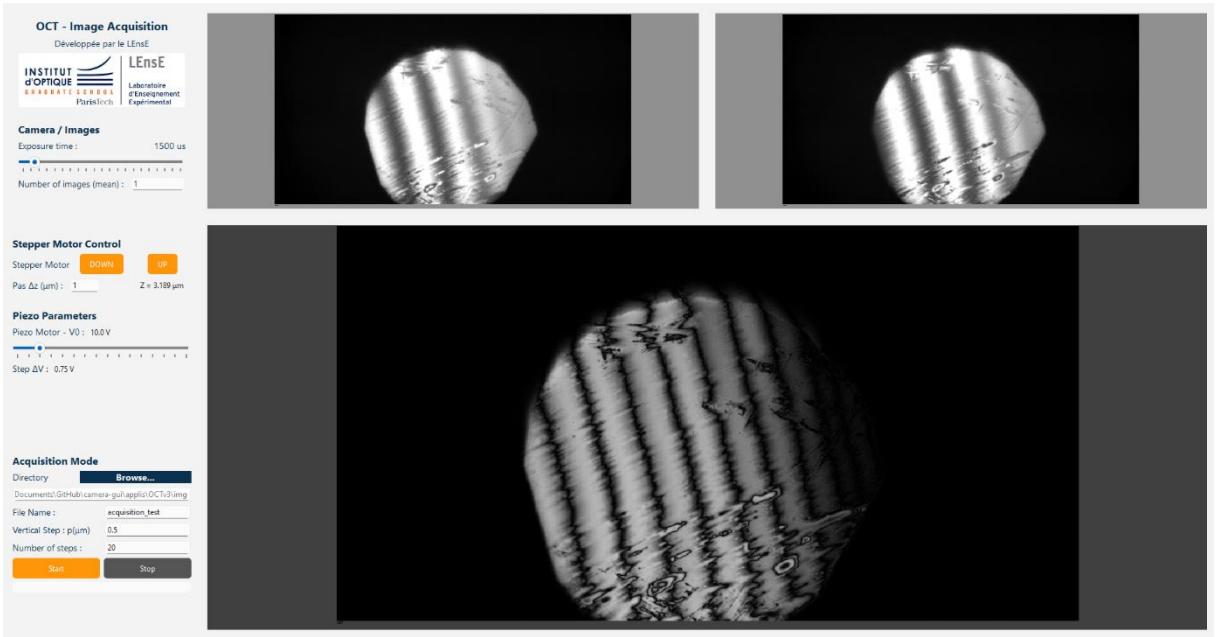
The red and green screws on the second arm are used to change the tip/tilt of the plate, be careful what screw you are turning!




Before you start, make sure the lamp, both piezo blocks and the motor controller (Thorlabs box) are turned on.

## III – OCT application guidelines

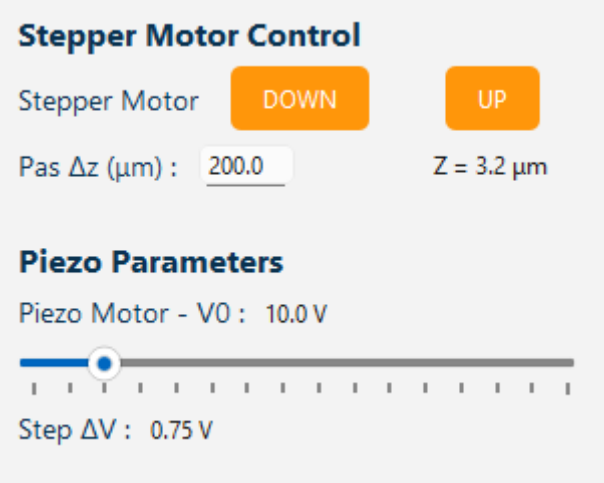
The application is structured as follows:




It has two modes: one that allows you to see what the camera sees in real time (live mode), and one that allows you to “scan”

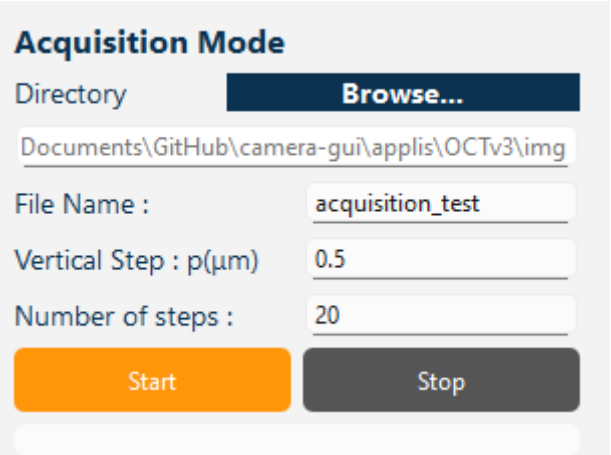
through your sample once you have found the optical contact (acquisition mode). You can tune the experimental parameters in the interface:


In the camera section, you can tune the exposure time (brightness) and the number of images that are averaged (more images mean less noise, but the app may lag)




The motors control section allows you to change the position of the stepper motor and the piezo actuator to find the optical contact.

The step $\Delta V$ represents the voltage step between the two images at the top of the display window.




The acquisition window contains the specifications for the acquisition phase (number of images taken, vertical separation between them...). You may start the acquisition only when you have specified all the necessary information. You can't specify an already existing file path

The display window displays three images. The top ones are taken at slightly different positions of the actuated platform, and the step $\Delta V$ has been chosen so that they are exactly out of phase. The bottom image is the result of the OCT calculation $(I_1 - I_2)^2$. It allows you to see whether you have an OCT signal very easily.

## IV – Acquisition procedure

To find the optical contact, boot up the application and put the interference filter on. The greater coherence length will make it easier to find. Move the second arm's platform or the motor until you find the fringes on the live mode display. Then, find where the contrast is at a maximum (you can use the microscope objective height screw to change the contrast) and switch back to white light.

Once you have found it, lower the motor slightly beneath the point of maximum contrast, as the acquisition is done from the bottom up. Specify the parameters of the acquisition and press start. The program creates a folder at the destination you specified, with the name you specified, and stores the OCT images as "name + index":


These are the result of the pre-treatment $I = (I_1 - I_2)^2$, and you can use them for further treatment.