To evaluate the energy deposited by the water jet on the samples, we have performed different measurements on Nb samples up to 100 bar, impinging on a sample for 10 s. The energy deposited by a moving jet at speed \( v \) is equivalent to the one deposited by a fixed jet with spot size \( \sigma \) impinging for a time \( \tau \) on a sample. Under these conditions, the energy deposited \( \sigma \tau \) is given by:

\[
\sigma \tau = \frac{\pi v^2}{2} \tan \left( \frac{\theta}{2} \right)
\]

where \( v \) is the speed, \( \theta \) is the angle of incidence, and \( \sigma \) is the spot size. Assuming a gaussian profile for the water jet, we determine the force and the spot size interpolating the measured data with the following expression:

\[
F = F_0 \sin(\delta) + \frac{1}{\sigma} \exp \left( -\frac{y^2}{\sigma^2} \right)
\]

where \( F_0 \) is the total force impinging on the load cell and \( \sigma \) is the water jet spot size.

The measurements confirm the “sin” dependence of force and spot size from the angle. This is important once the cleaning effect on the curved cavity surfaces will be studied.

The oxidation has been studied using monochromatic light and the theory of optical properties of thin film. The two pictures are the same as the top picture but illuminated by laser light at the reported wavelengths. This analysis method might help in determining the thickness of the oxide layer. In particular, at 543 nm a plot of reflectivity vs oxide thickness is shown. The minima in reflectivity correspond to the dark rings in the picture.

Effect of a static jet (p=100 bar, \( \sigma=0.345 \) mm) impinging on a Nb sample with a speed corresponding to 10 s static jet. The presence of only small area of blue color agrees with the “10 s” static case.

Effect of a moving jet (p=100 bar, \( \sigma=0.345 \) mm) impinging on a Nb sample with a speed corresponding to 10 s static jet. The presence of only small area of blue color agrees with the “10 s” static case.

Effect of a moving jet (p=100 bar, \( \sigma=0.345 \) mm) impinging on a Nb sample with a speed corresponding to 10 s static jet. The presence of only small area of blue color agrees with the “10 s” static case.

The characterisation of the spot size versus distance and the confirmation of the angular dependence of both force and spot size will be used to optimized the HPR cleaning process.

\[ F = 0.03465 \sigma + 0.05158 \]

The characterisation of the spot size versus distance and the confirmation of the angular dependence of both force and spot size will be used to optimised the HPR cleaning process.