# NEW OPTION AT ID10B (TROIKA II) BEAMLINE
# HIGH ENERGY FOR
# SURFACE STUDIES AT LIQUID/LIQUID INTERFACES

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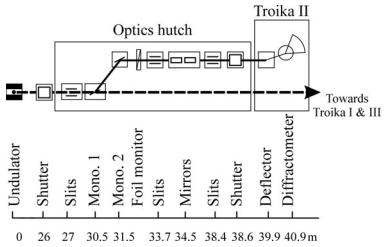
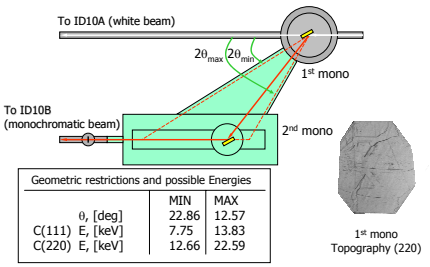
http://www.esrf.fr/UsersAndScience/Experiments/SCMatter/ID10B/

## How we extend the available energy rainge at ID10B

### ID10B layout




### Double crystal monochromator

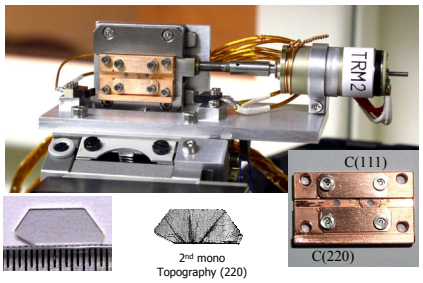



| Geometric restrictions and possible Energies | MIN | MAX |
|---|---|---|
| θ, [deg] | 22.86 | 12.57 |
| C(111) E, [keV] | 7.75 | 13.83 |
| C(220) E, [keV] | 12.66 | 22.59 |



1st mono Topography (220)

### Upgraded 2nd monochromator stage







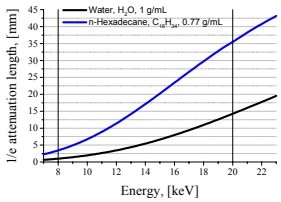

2nd mono Topography (220)

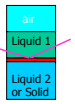
Double crystal monochromator of the ID10B beam line has two functions: 1) provide monochromatic X-ray beam and 2) be transparen to split the beam. The latter constrain together with fixed exit aperture after 1st monochromator defines the energy rainge and limit the choice of possible monochromator crystals. The use of second paire of diamond crystals with symmetric Bragg reflection (220) allows to keep transparent optics and extend the energy range from 8 – 13 keV to 8 – 22 keV.

## Why we need high energy at ID10B

Surface scattering studeis on buried interfeces (liquid/solid, liquid/liquid or solid/solid) face with the problem of attenuation of the incident and scattered beam in the media trough which it travels. Figure on the righthand side demonstrate on an example of the liquid media that a way to overcome this problem is the use of high energy.

### Attenuation length

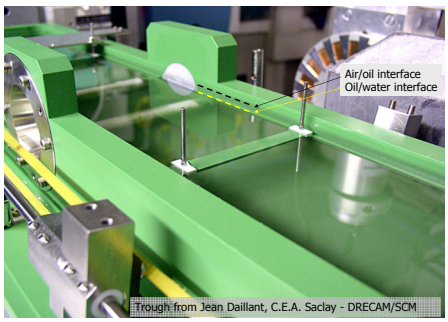


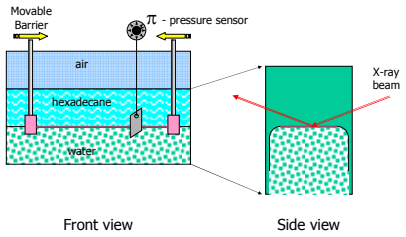




### Why to study the liquid/liquid interfaces

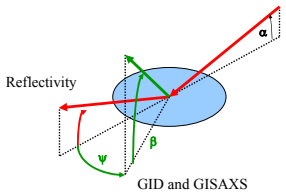
The liquid-liquid interface plays an important role in many physical, chemical and biological processes of everyday life. Its characterization would enhance our understanding of fundamental processes occuring in nature.

## Langmuir trough for Liquid/Liquid interface

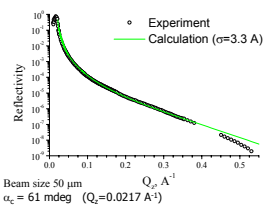


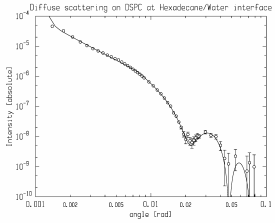

## Experimental Results



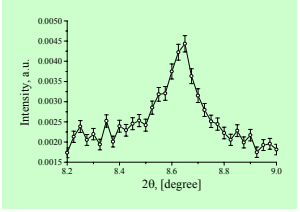

### Reflectivity on the Air/$H_2O$ interface



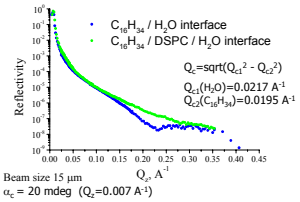

### Diffuse scattering on the Oil/$H_2O$ interface




### GID on DSPC monolayer at Air/$H_2O$ interface




### Reflectivity at the Oil/$H_2O$ interface




## Conclusions

Energy range of the ID10B beamline extended to 22.5 keV

Surface scattering techniques on the liquid/liquid interface has been successfully tested and is available now at the ESRF only at ID10B.

Obtainable flux of ~$6 \cdot 10^{10}$ at 20 keV is enough to performe
- Reflectivity
- Diffuse scattering in the plane of incidence
- Diffuse scattering in the plane of surface
- Grazing Incidence Diffraction (not in all cases)

X-rays give 3 times larger $Q_z$ range for reflectivity and several orders of magnitudes more in dynamic range in comparison with the Neutrons ($Q_z$<0.15, $R_{min}$~$5 \cdot 10^5$)

### GID on DSPC monolayer at Oil/$H_2O$ interface

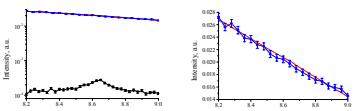



Figure on the left side present on the same scale GID signal on the monolayer of DSPC at the air/water interface (black curve) and the background produced with hexadecane (blue curve). Red curve is the sum of black and blue curves, which simulate expected GID signal on the monolayer of DSPC at the oil/water interface. Figure on the right side is the zoom of top curves.