Nanopositioning for the ID16A-NI endstation


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Biomedical research
Sub-cellular processes

Anti-malarian drugs

Nano/Micro-Technology: 3D Integration
Voids in Through-Si-via
Bleuet et al (CEA-Leti)

ID16A–NI
185 m

ID16B–NA
165 m

UPBL4 Layout
Optics Hutch
34 m
Magnified HoloTomography

Run out < 50nm

X-ray Fluorescence Microscopy (2D/3D)

YZ scan resolution 5nm

Ptychographic Nano-Tomography (ultimate resolution)

With F. Pfeiffer et al.
Vacuum + parasitic movements < 50nm

Correction of the guiding errors of a rotation stage by piezo actuators
Movement of the hexapod is made under the control of capacitive sensors looking at 2 metrologic reference surfaces.
The hexapod is also used to scan the sample (2D fluorescence microscopy)
Tz error **without** compensation
**ROTATION STAGE ERROR COMPENSATION**

Tz error **without** compensation

![Graph showing Tz error without compensation](image1)

Tz error **with** compensation

![Graph showing Tz error with compensation](image2)
**ROTATION STAGE ERROR COMPENSATION**

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X-rays
KB optics
fixed curvature 17keV
Focal spot size 20nm

R. Baker
95mm working distance microscope

In situ visualization of the sample during alignment.

O. Hignette
Focus size: 75 nm (July 2014) → 50 nm (August) → 30-40 nm (September)

Scan of a knife-edge with the piezo-actuators

A. Pacureanu, Y. Yang, F. Fus, S. Bohic, P. Cloetens
**Focus stability:**
1 nm repeatability for successive knife-edge scans
Down to **6 nm (!)** over 8 hours horizontally
Down to **30 nm** over 8 hours vertically

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**Horizontal stability**

- **5 nm**
- ~ 8 hours

**Vertical stability**

- **40 nm**
- ~ 9 hours
FURTHER WORK: THERMAL DRIFT

- Measure and control the position of the KB relative to the sample: 3 laser interferometers
- Thermal modelling of the station + temperature sensors
- Reduce the heat sources (2 of the 4 motors switched off on rotation stage)

Long term drift in the Z direction
~ 9 hours

40nm

Reduce the sensitivity to heat change (invar)
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Reduce the heat sources (2 of the 4 motors switched off on rotation stage)

Reduce the sensitivity to heat change (invar)
Samples at 100K to limit the radiation damage
Liquid nitrogen cooled + conductive braid

P van der Linden

2\textsuperscript{nd} KB optics focussing at 33.6 keV
Thank you for your attention