

White beam microdiffraction setup on BM32



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History

- BM32 is a surface/interface scattering beamline
- Strain measurements in thin films under grazing incidence:
 - nuclear materials (ZrO₂ on fuel cladding)
 - micro-electronics materials: interconnect lines (blanket + array of lines) (O. Sicardy)
- StressNet network -> need for stress determination within individual micro-object, with sub-grain resolution

CEA + CNRS made the decision to build such a device on BM32 (2005->2006)

Interest of BM32:

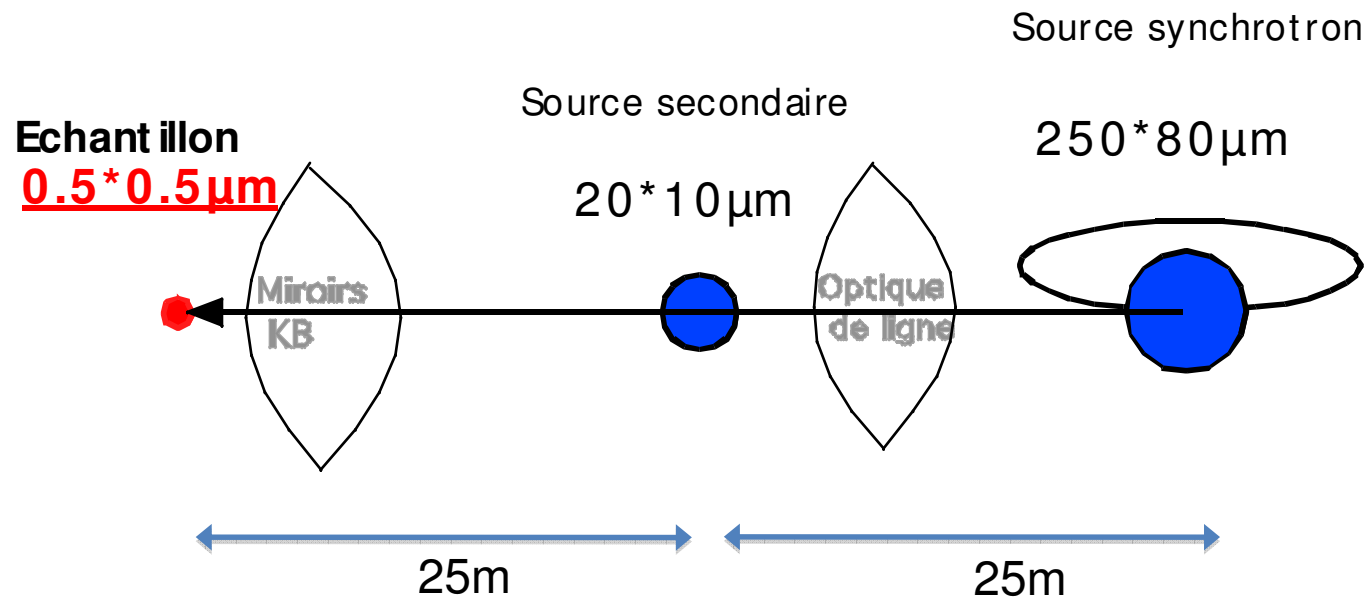
- bending magnet -> white spectrum
- high E + high B magnet -> up to 30keV
- focussing element in the optics

Boundary conditions:

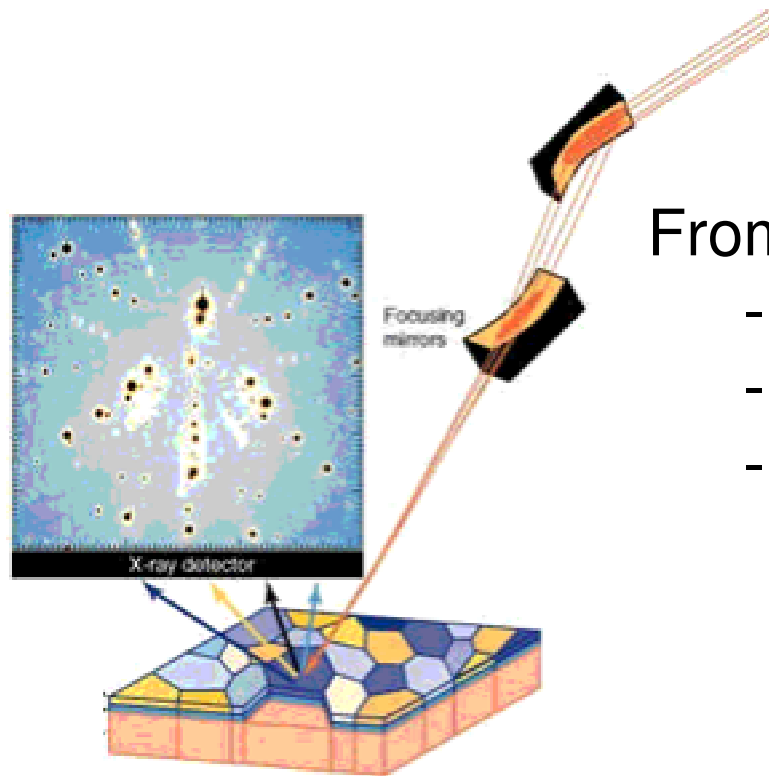
- fixed (lead) walls
- compatible with existing optics & experiments



A two-step demagnification with secondary source



Principle: raster scan the sample with a micro- white beam

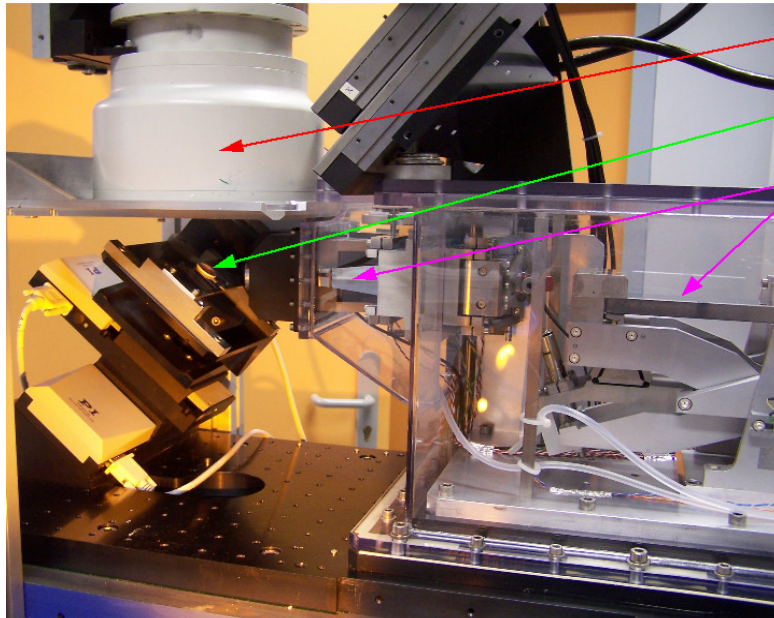


From the Laue diagrams

- Orientation(s) of the grain(s)
- Deviatoric part of the strain tensor
- ...

(Tamura et al.)

Present setup



View of the microdiffraction setup

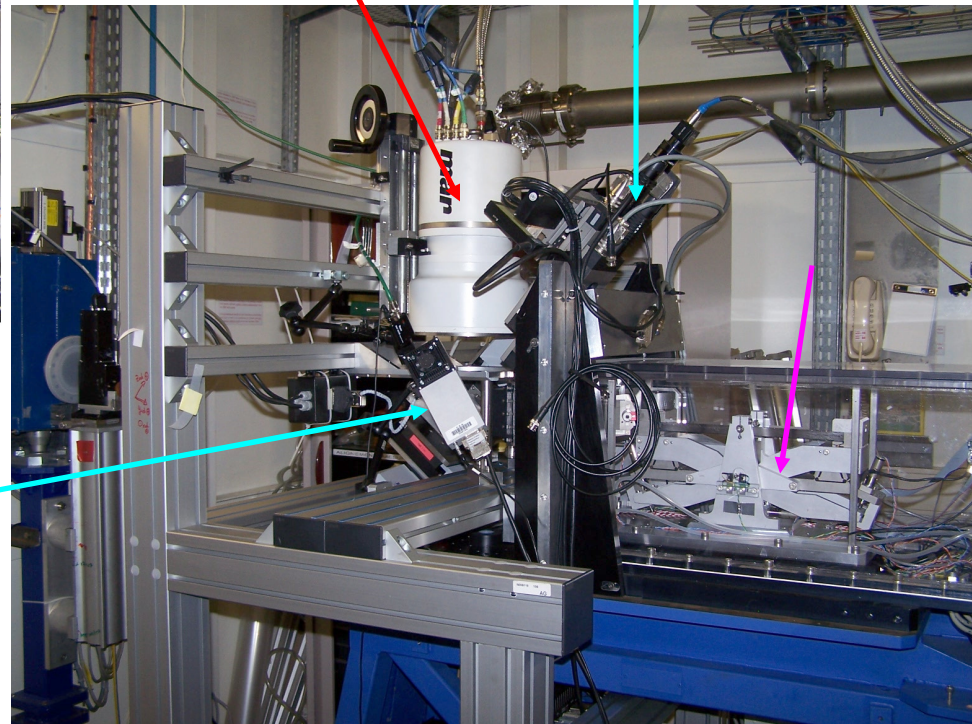
2D Detector

Sample at 40°

Focussing mirrors

Microscope visu

Détecteur de fluorescence



Découplage caméra

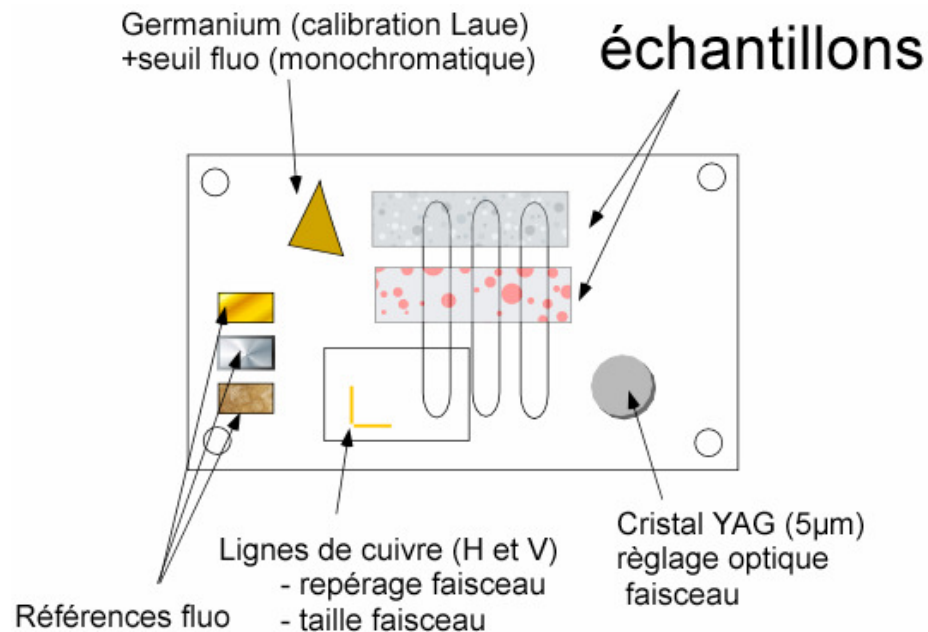


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Caractéristiques faisceau

- taille
 - moins de $1\mu\text{m} \times 1\mu\text{m}$ en routine
 - $>$ après réglages $0.5 \times 0.7 \mu\text{m}$
- optimisation et automatisation (macros) des procédures de réglages
- optimisation du repérage Ge, YAG fin, ligne Cu + échantillon



- système de pilotage autonome (Wago)

Developments (ANR MiDiFaBI)

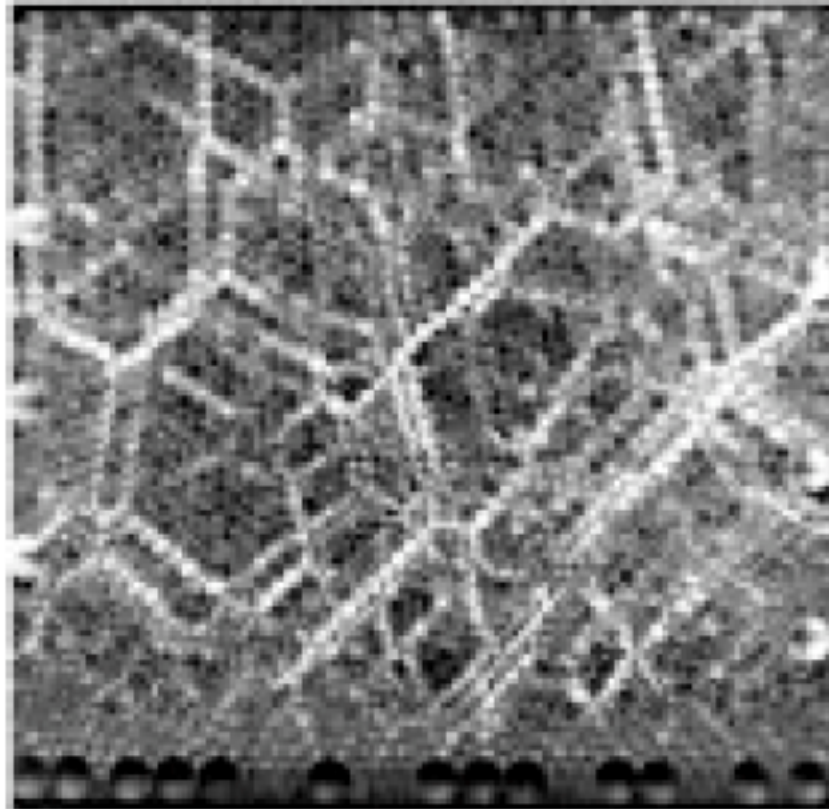
Hardware

- Detection: faster, more accurate, more complete
- Focussing: smaller spot, larger aperture
 - > fixed curvature KB
- More sample environment
 - Temperature, electrical contact, ...

Developments

- Vibration tracking
- Software developments
- New techniques
 - Laue tomography
 - Energy determination
 - 3D mapping
 - ...

Stress distribution in granular media



Thanks to

- Gold sponsors



- Silver sponsors



- Involvement of the BM32 staff
- Support of the scientific community



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