

**The CRISTAL beamline
for
Crystallography and
Condensed Matter Physics**

Sylvain Ravy, Erik Elkaïm

Synchrotron-Soleil, Lure

Scientific case

Project initiated by:
Association Française de Cristallographie
Regrouping 10 laboratories

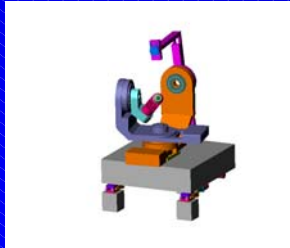
Time-resolved expts:
GMCM, Rennes
LCM3B, Nancy

- **Structure determination, electron density**

- Precise measurements
- Stability
- **4-circle**



- **Phase transformations**



- Diffuse scattering, anomalous scattering
- Use of coherence (Stability)
- Complex environments (Cryostats, ovens, fields)
- **6-circle**

- **Powder structure**



- High resolution
- Anomalous scattering
- **2-circle**

Beamline setup

Optical
Hutch

Experimental
Hutches

Command
room

U20, Short section

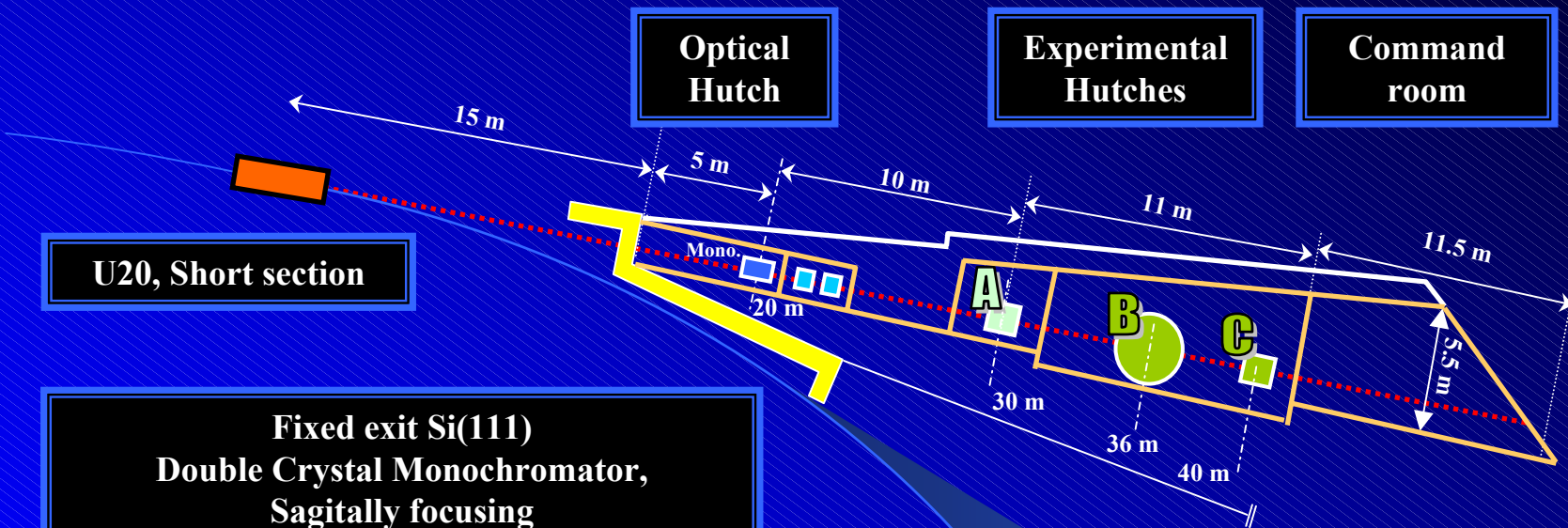
Fixed exit Si(111)
Double Crystal Monochromator,
Sagittally focusing
2 Mirrors, vertical focusing

Three **distinct** and **fixed** instruments

A : 4-circle diffractometer (commercial)
Single crystals structure determination

B : 6-circle diffractometer
Diffuse scattering, Coherence, Anomalous scattering

C : 2-circle diffractometer
Powder diffraction

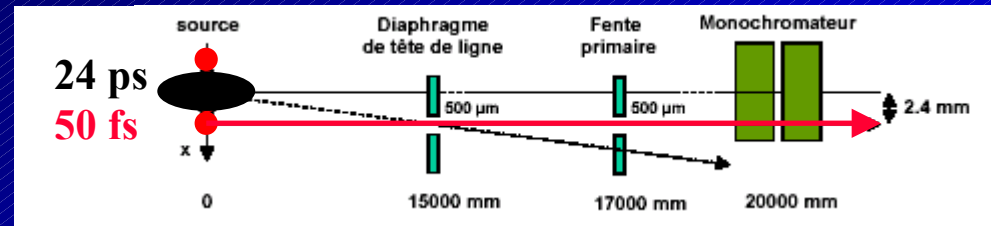


Beamline characteristics

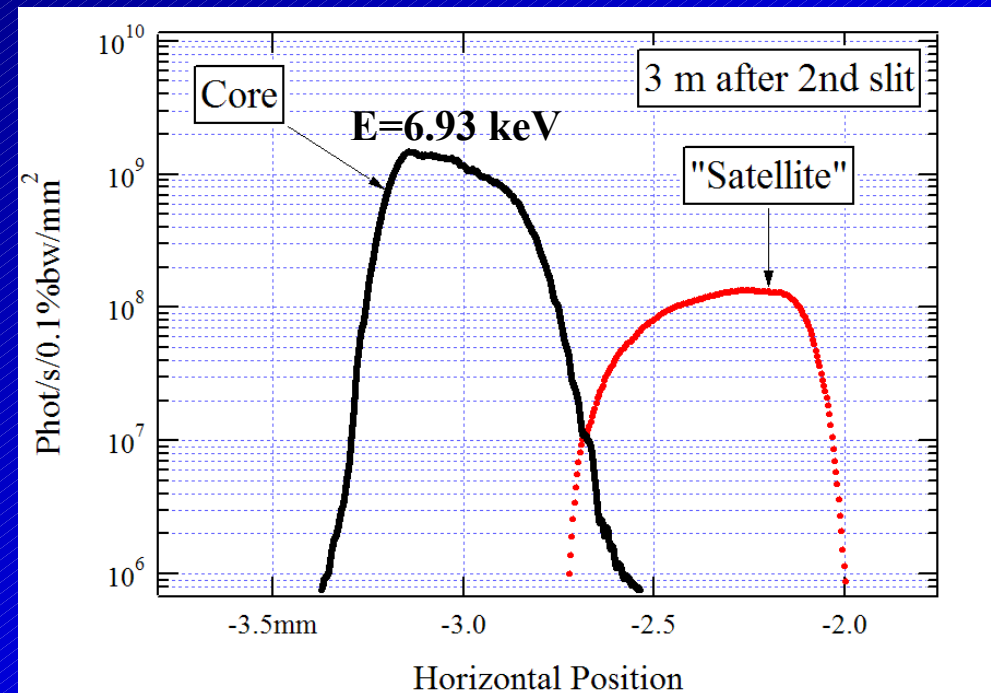
Source	Energy range	Experiment	Beam characteristics				Sample environments
			Size FWHM (mm)	Diverg. FWHM (mrad)	Res. $\Delta E/E$	Flux (ph/s)	
Undulator U20	4-30 keV	4-circle standard (Single crystal)	H : 0,200 V : 0,200	H : 0,200 V : 0,100	Si(111) 10 ⁻⁴	10 ¹³ (15 keV)	Cryostat, N ₂ , He
		6-circle (General)	H : 1,700 V : 1,000	H : 0,040 V : 0,030		6 10 ¹³ (8 keV)	Charge → 30 kg. Cryostat 6K, four, Fields E, B,
		2-circle (Powders)	H : 1,700 V : 0,700	H : 0,035 V : 0,020		2.5 10 ¹² (22 keV)	Cryostat, oven (800 °C)

Calculations

T. Moreno, M. Idir



O. Chubar
A. Louergue
A. Nadji
L. Nadolski
M.-P. Level



- « Femto » pulse shifted by ~ 2.4 mm
- Signal to noise ratio > 100
- Flux $\sim 5 \cdot 10^6$ ph/s with Si(111); $\sim 10^8$ ph/s with graphite

For what science ?

- **Photo-induced phase transformations (E. Collet)**
 - **Mechanism of phase transition in time**
- **Time-resolved electron density determination (S. Pillet)**
- **Structural study of coherent phonons**
- **Study of non-thermal transitions**
 - **Other ideas from this workshop...**