

# Crystallography at the LLB-Orphée neutron source: Celebrating 2014 and looking forward

Florence Porcher



*Laboratoire Léon Brillouin, CEA/Saclay, France*



**ILL & ESRF**  
European Neutron & X-Ray Sources

<http://www.xray.cz/xray/csca/kol2009/abst/mikulik-ceslab.htm>

**LLB & SOLEIL**  
French Neutron & X-Ray Sources

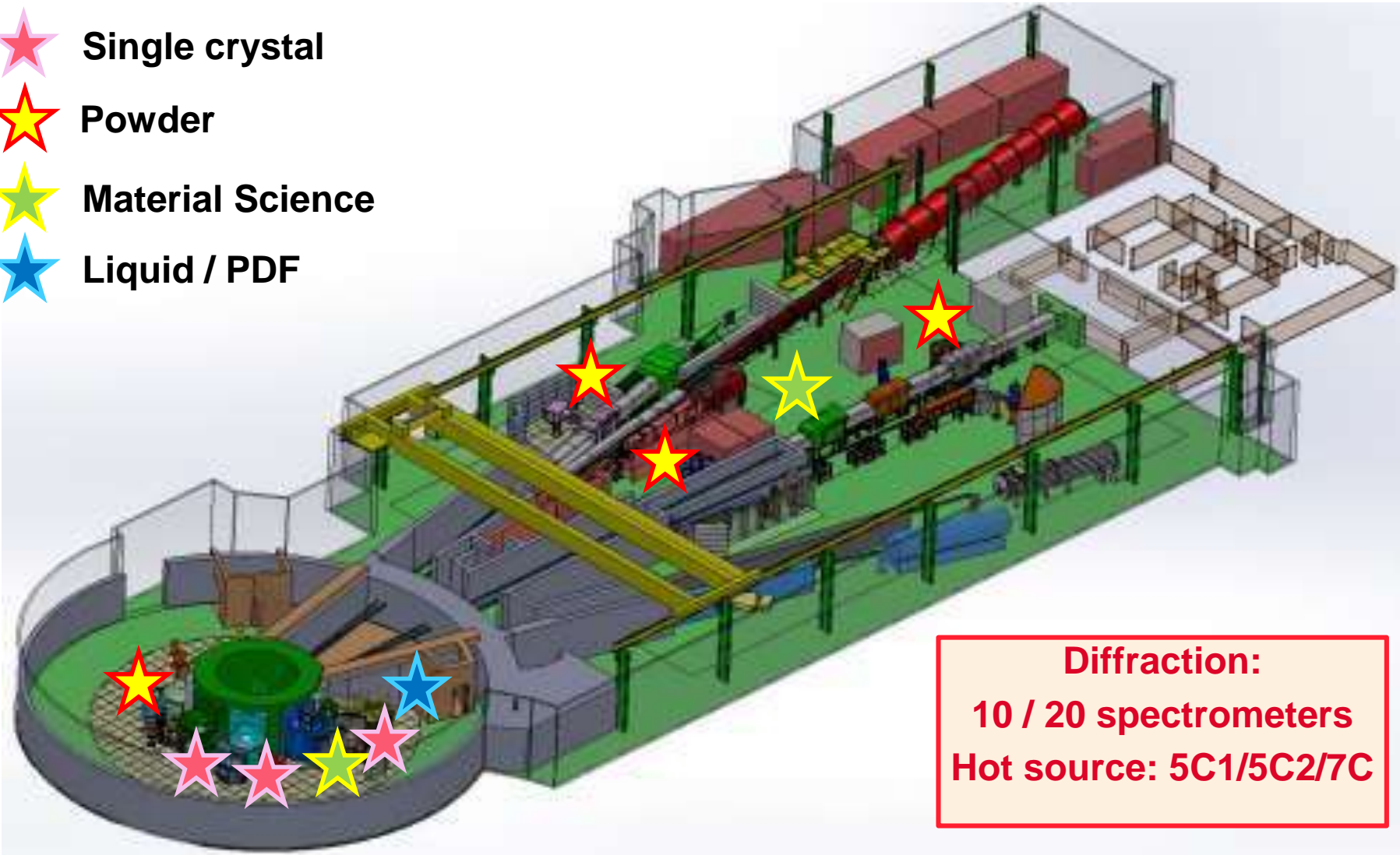
Neutron centers (Diffraction)  
ILL / ISIS / FRMII / LLB /  
PSI / HZB / BNC  
(PNPI, IBR2,)

# The LLB-Orphée facility



2014

- ★ Single crystal
- ★ Powder
- ★ Material Science
- ★ Liquid / PDF



**Diffraction:**  
10 / 20 spectrometers  
Hot source: 5C1/5C2/7C

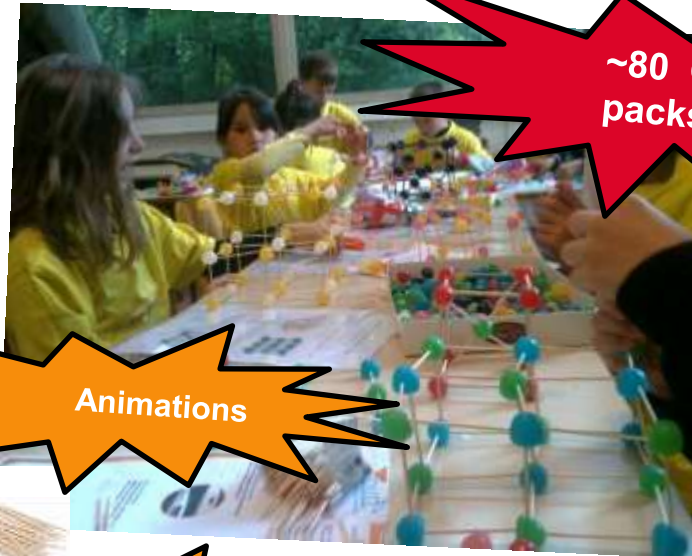
# LLB missions as a national source

- *LLB research program*
- *Build + Run spectrometers around Orphée*
- Local contact (standard experiments, exploratory studies)
- Access to neutron scattering for Industrial users
- Formation of students in relation with Universities and Grandes Ecoles  
Complementary formation of researchers
- *Definition and coordination of scientific and instrumental actions of the French community concerning the forecoming European Spallation Source (Lund, Sweden)*

**EDUCATION IN NEUTRON SCATTERING (CRYSTALLOGRAPHY)**  
→ Who, How, How long...

# THE 2014 IYCr SPECIAL EVENTS

2014



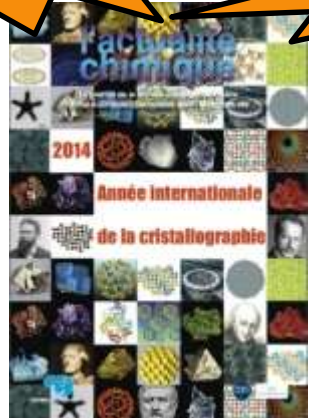
~80 Candy packs (20kg !)

Conferences

Animations

Litterature

Visits



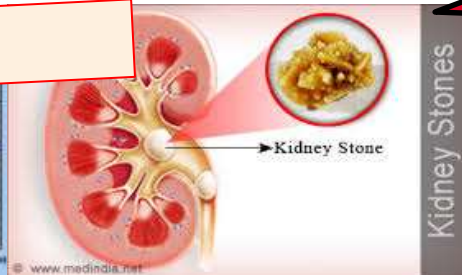
# Higher Education: co-organisation of practicals

2014

Universities – Grandes Ecoles



School of Medicine



Kidney Stones

64 neutron x days on spectrometers

1 day → 2 weeks

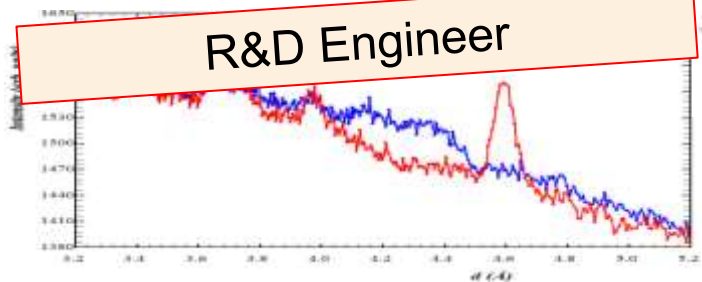
Topics

Hercules « Condensed Matter »

Topic	Lead	Duration
Stress and texture studies using neutron diffraction (Diane/6T1)	L. Mangin-Thro + part 4 V. Klozek	3
Stabilization by nanoparticles of nanostructured emulsions (TPA)	S. Désert	1, 2 + part 4
Neutron powder diffraction and Rietveld refinement (G4.4)	M. Lenertz	3+ part 4

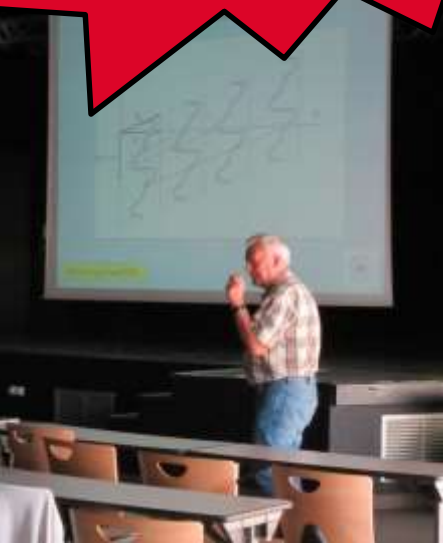


R&D Engineer



# Organisation of integrated formations

**ON SITE**  
**Lectures**  
**Practicals**  
**→ First Contact**  
**→ Open discussions**



	Sept. 21st	Sept. 22nd	Sept. 23rd	Sept. 24th
		Breakfast	Breakfast	Breakfast
		Diffraction - Nuclear structures (V. Petrášek, Prag)	Diffraction - Magnetic structures (J. Rodriguez-Carvajal, Grenoble)	Crytology (B. Toudic, Nantes)
		Pause	Pause	Pause
		Instrumental aspects (H. Gornik, Grenoble)	Pol. Neutrons, Extreme conditions (A. Galka, Paris)	SIN Prize (Introduction) Conf. by award of the Prize & by T. Zemb
		Lunch	Lunch	Lunch
		Registration		
		Practicals - Nuclear structures (V. Petrášek, Prag)	Practicals - Magnetic structures (J. Rodriguez-Carvajal, Grenoble)	
		Pause	Pause	
	Boos of Crystallography (J. Perez, Cas)	Introduction to reflectometry (E. Kesteliger, Jülich)	Diffraction scattering (J. Mirebeau, Saclay)	
	Pause	Tutorials (V. Filizet, Saclay)	IRIS and other spectroscopies (S. Petit, Saclay)	
	Boos of Diffraction (P. Becker, EPF)	Pause	Pause	
	Dinner	Dinner	Buffer	
	Neutrons: Production and sources (P. Coqueret, Grenoble)	Poster session		



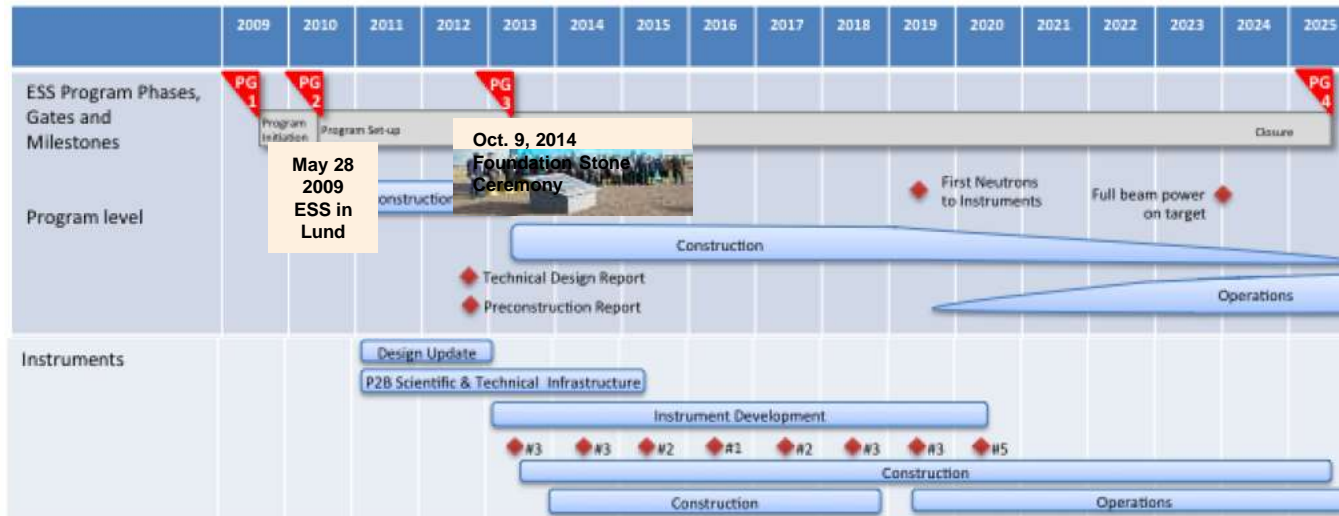
# Future actions ?

## LLB missions as a national source

- Definition and coordination of scientific and instrumental actions of the French community concerning the forecoming European Spallation Source (Lund, Sweden)

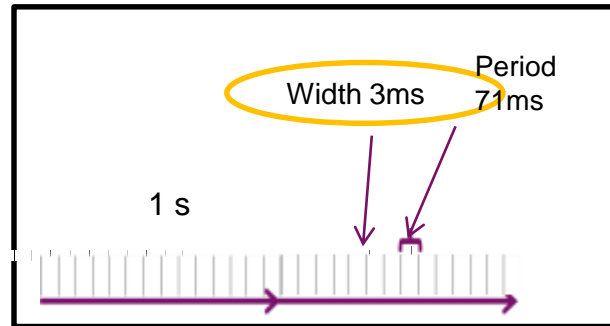
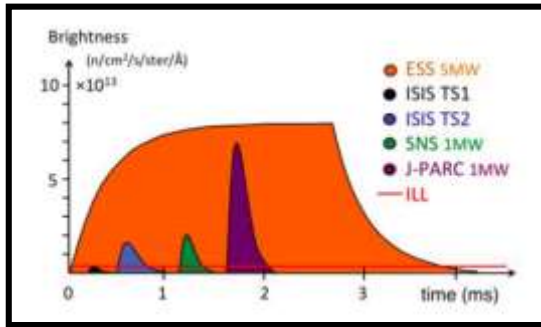


### Preparatory Phase





# The ESS Instrumental suite (Showcase & status)



TOF  
22 → 16 instruments

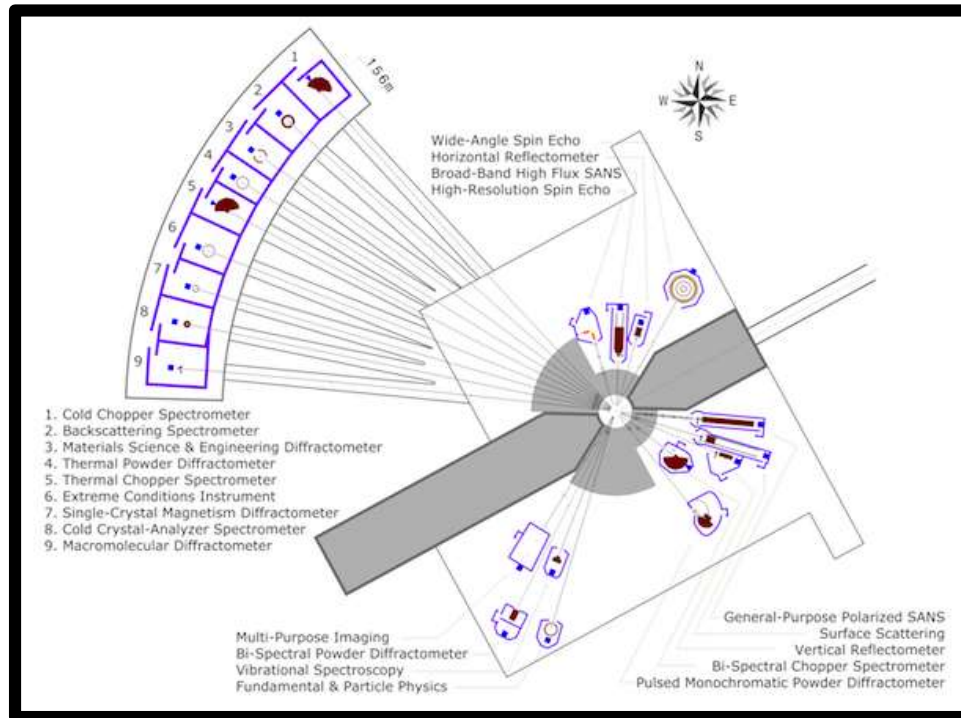
## Status in 2015

### Phase 1 (2012)

LoKI	SANS
NMX	Protein Diff.
ODIN	Imaging

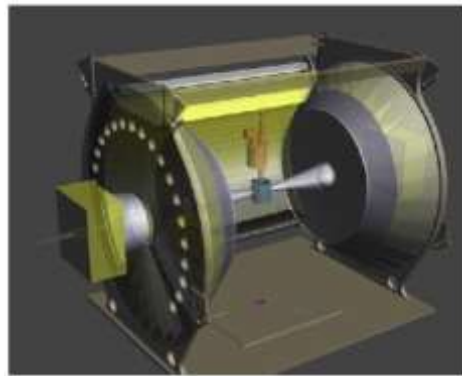
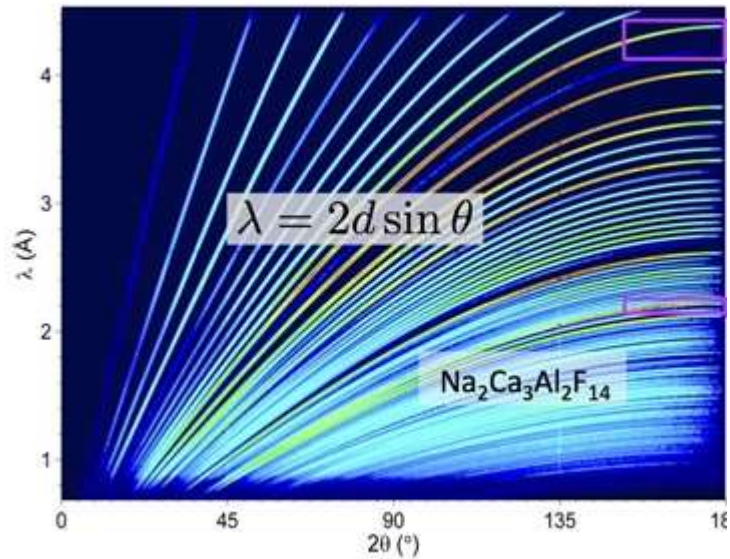
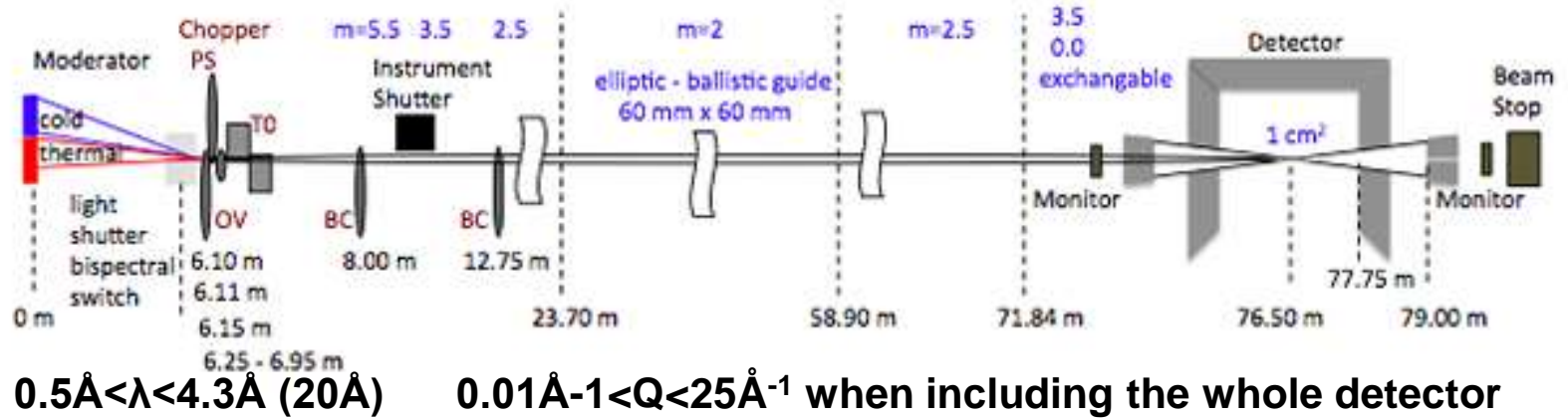
### Phase 1 (2014)

SKADI	SANS
FREIA	Reflectometer
ESTIA	Reflectometer
CAMEIA	Spectrometer
VOR	Cold spectrometer
C-SPEC	Cold spectrometer
DREAM	Powder Diff.
HEIMDAL	Powder Diff.
BEER	Engineering Diff.



<http://europeanspallationsource.se/>

# DREAM: neutron powder diffraction at ESS

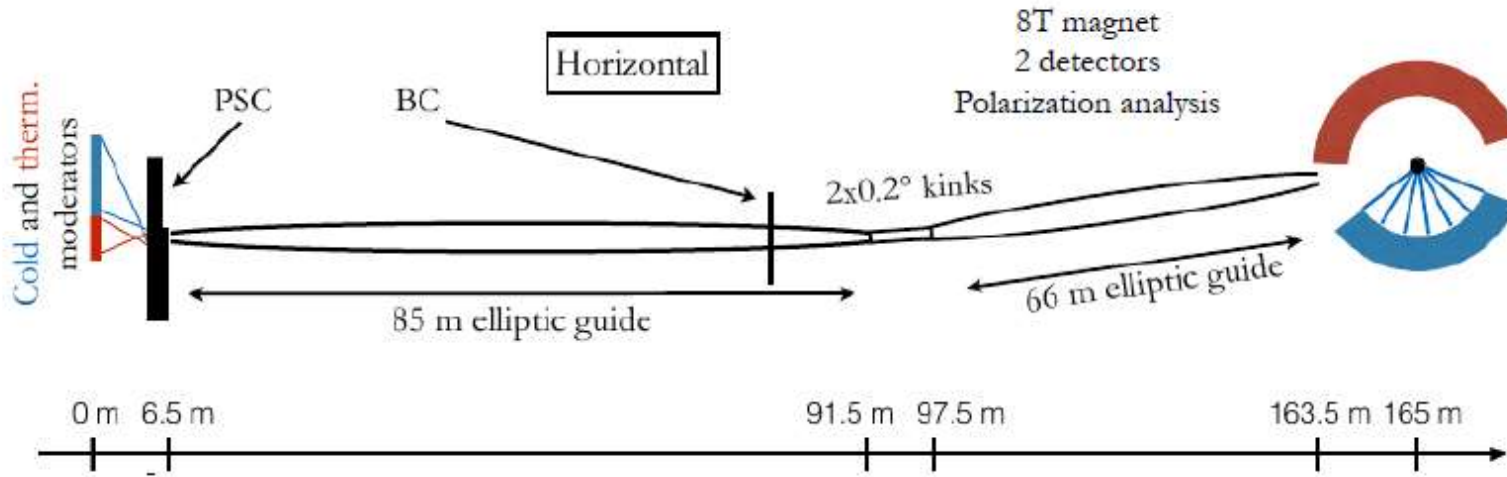


Sample environnement:  
T, P, H, gaz,  
Electrochemistry...

W. Schweika (JCMS / ESS)  
K. Lieutenant (HZB)  
N. Violini (JCMS)

<http://europeanspallationsource.se/realizing-dream-versatile-powder-diffractometer>

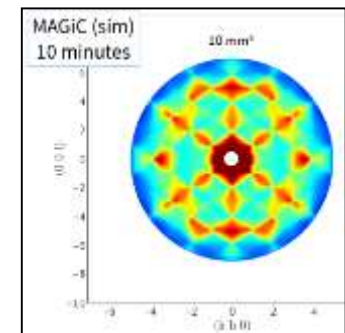
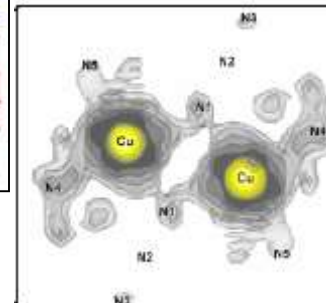
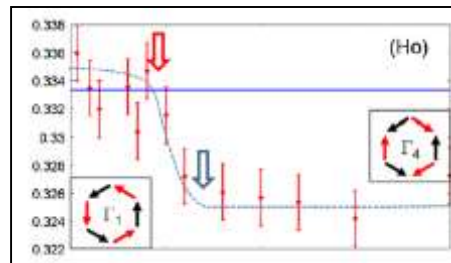
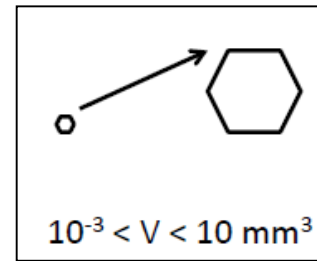
# A MAGIC Single crystal diffractometer ?



**Sample environnement:**  
**T, P, H, H<sub>pulsed</sub>, ...**

**Polarisation analysis**

A. Gukassov (LLB)  
 F. Fabrèges (LLB)  
 W. Schweika (JCNS/ESS)

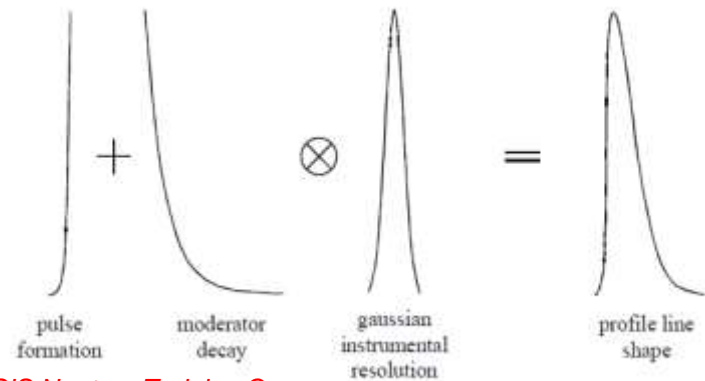
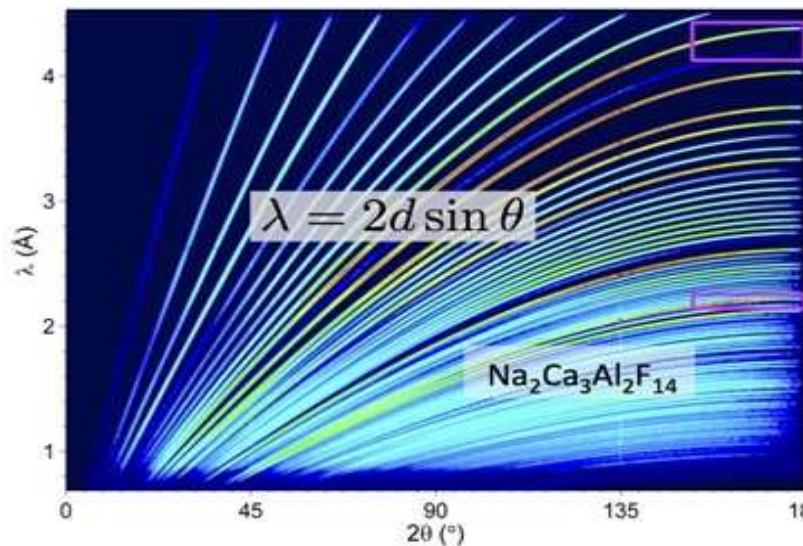


# From monochromatic to TOF: Taming neutron scattering

- New methods for data analysis (TOF  $\Leftrightarrow$  ISIS, ORNL,...)
- Education of neutron diffraction from general University lectures ?
- Possibilities gained/lost with TOF machines  $\rightarrow$  X-Ray experience ?

$\rightarrow$  Training tour « Spallation source & instruments »

$\rightarrow$  Practicals « Simulation of a TOF experiment »



ISIS Neutron Training Course

**THANK YOU FOR YOUR ATTENTION**