
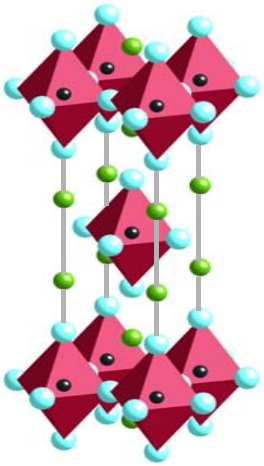
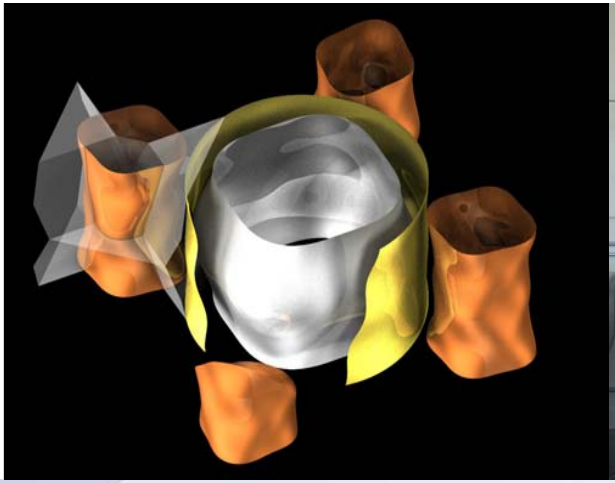


Workshop on Diffraction at Low-Temperature and High-Pressure at I15 – Extreme Condition Beam Line

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Aim of this Workshop

Diffraction at high pressure is a routinely used technique to explore structural properties of condensed matter. This technique is now being combined with **extreme temperature** conditions.

Present I15 user group:

- Earth/planetary science
- Solid-state chemistry/materials science
- Elemental/**cryogenic physics at high pressure**
- Liquid state behaviour
- …

The goal of this workshop is to highlight the importance of **low-temperature** structural data at high pressures in conjunction with **electronic, magnetic, and optical properties** and …

… **to discuss potential experiments on I15**.

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Diffraction at Low-T and High-P

-a selection-

- Membrane DAC, T>46 K (Le Toullec et al., High Pressure Research **8**, 691 (1992))
- ^{4}He EOS from single x-tal, T>46 K (P. Loubeyre et al., PRL **71**, 2272 (1993))
- D_2 EOS from powder, T= 83 K (Kawamura et al., SSC 119, 29 (2001))
- O_2 at T>19 K (Akahama et al., PRB **64**, 054105 (2001))
- EOS of Zn at T=40 K (Takemura et al., J. Phys. Condens. Matter **14**, 10563 (2002))
- EOS of $CeCu_2Ge_2$ at T=10K (Onodera et al., SSC **123**, 113 (2002))
- FeGe, T=80K (Pedrazzini et al., PRL **98**, 047204 (2007))

…but many other elements/compounds to be studied below 10K:

- H_2, molecular solids and cryo-crystals
- High-T_c superconductivity in iron pnictides
- …

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Low-T experiments on 2nd station

- Methods
  - Powder and single x-tal diffraction (EOS, phase transitions,…)
  - Crystal growth at low-T and high-p
  - Raman spectroscopy
  - *Resistivity, magnetic susceptibility, specific heat*
  - …

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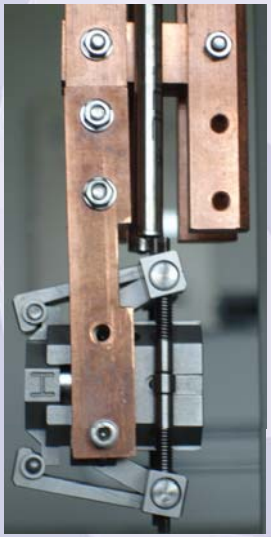
- Devices
  - Pulse tube cooler (T > 3.8K) combined with bespoken DAC



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- Methods
  - Powder and single x-tal diffraction (EOS, phase transitions,…)
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  - …
- Devices
  - Pulse tube cooler (T > 3.8K) combined with bespoken DAC
  - CCD ‘Ruby’ (ϕ=135 mm, 48 µm pixel size), including CrysAlis suite (Ox Diff)
  - Image plate ‘MAR345’ (ϕ=345 mm, 100 µm pixel size)
  - Raman spectrometer
  - *Equipment for $\rho(T)$, $\chi(T)$, $c_p(T)$ at high-p*
  - …
- Samples
  - Elements
  - Molecular crystals
  - Correlated electron systems (including pnictide superconductors)
  - …

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Programme

9:40 – 10:05	**Low Temperature Powder and Single Crystal Studies of Elements** Prof. Malcom McMahon (The University of Edinburgh)
10:05 – 10:30	**Resonant x-ray diffraction from electronic phase separations in quantum phase transitions** Dr Marc de Vries (University of St. Andrews)
10:30 – 10:50	Coffee break
10:50 – 11:15	**High Pressure, Low Temperature Studies of Unconventional Superconductivity and Novel Quantum Order** Dr Emma Pugh (University of Cambridge)
11:15 – 11:40	**Recent examples of pressure-induced phase transitions in strongly correlated electron systems** Prof. Mohsen Abd-Elmeguid (University Cologne, Germany)
11:40 – 12:45	Discussion
12:45 – 13:30	Lunch
13:30 – 15:00	Tours to I15

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Acknowledgement

•Organization team: Dr David Price and Sara Fletcher

•DLS: for financial support

Discussion:

1. Setting up cryostat on 2nd table (offline jobs)
2. Commissioning (online; beam time needed in addition to maintenance time)
3. What kind of additional probe is most useful?
4. Allocating beam time for experiments
5. Upgrading cryostat