Phase 1 - New 2D detector, \( \times 6 \) efficiency, high resolution more often

Completed and tested according to timescale and cost

Phase 2 - Primary Spectrometer - Objectives

1) To rebuild the monochromator mechanics, primary collimation and filter system to ensure greater stability, easier access to the monochromator, and improved efficiency.

2) To rebuild the sample table mechanics & provide a larger choice of wavelengths, especially 3.152Å from Ge[311], and eventually 6.3Å from Ge[111], to extend high resolution to longer d-spacings.

Phase 3 - Sample Environment

1) To provide a larger choice of sample environments, faster changes of samples and sample environments...
Na$_2$Ca$_3$Al$_2$F$_{14}$ standard on super-D2B
Objective 2 - To provide a larger choice of wavelengths

a) The D2B monochromator mechanics is constrained to a very small space
- Access is only possible from the top of the beam-line casemat
- The 22-year old primary collimators have degraded with time

b) The limited space available has meant that only a single monochromator can be accommodated - Ge[hkk] bent wafer technique.

c) The Ge[hkk] monochromator has the advantage that a number of different wavelengths can be obtained:

<table>
<thead>
<tr>
<th>[hkk] plane</th>
<th>Wavelength</th>
</tr>
</thead>
<tbody>
<tr>
<td>[557]</td>
<td>1.051 Å yes</td>
</tr>
<tr>
<td>[337]</td>
<td>1.277 Å yes</td>
</tr>
<tr>
<td>[551]</td>
<td>1.464 Å yes</td>
</tr>
<tr>
<td>[335]</td>
<td>1.594 Å yes</td>
</tr>
<tr>
<td>[331]</td>
<td>2.398 Å yes</td>
</tr>
<tr>
<td>[113]</td>
<td>3.152 Å no</td>
</tr>
<tr>
<td>[111]</td>
<td>6.3 Å yes?</td>
</tr>
</tbody>
</table>
Progress with objective 2

- The D2B monochromator mechanics has been rebuilt.
- New 5’ and 10’ collimators have been installed.
- AZ-Systemes proposal for new diffractometer base ~100K€
- Judged too expensive - new proposal for 55K€ to be discussed
- Luc Didier prefers in-house solution - to be discussed next week
- It appears impossible to find space for a monochromator changer.
- A new type of graphite filter was proposed to eliminate harmonic contamination by reflecting those wavelengths out of the monochromated beam - tests show this not feasible.
New Monochromator Mechanics and Primary Collimators
Objective 3 - To provide a larger choice of sample environments

- Almost all experiments need increasingly complex sample environments. (See the list of current UK commissioning experiments).
- New pulsed tube refrigerator (5K-300K) - working routinely.
- Temperature insert for refrigerator -> 300C - working routinely.
- New cryomagnet (7 Tesla) at low temperatures (arrives 20th July)
- New high pressure cell at low temperatures (to be tested on D2B).
- Dilution refrigerator insert ~100 mK (1st test experiment 2 August)
- New high temperature furnace, controller, controlled atmosphere.
Summary of proposed work July 2006 – June 2007

- July 2006: Tests on D2B of the old D1A hot-pressed Ge.
- July 2006 – July 2007: Provided the tests indicate that a new mono. is feasible, production of a new 300x50x10mm Ge[hhk] monochromator. Full Cost: 46 K€.
- July 2006 – Oct 2006: Growth of high quality Ge single crystals
- Jan 2007 – April 2007: Hot-pressing of Ge crystals