# Beamline P61B: Large Volume Press.

## *In situ* high-pressure LVP studies using synchrotron radiation


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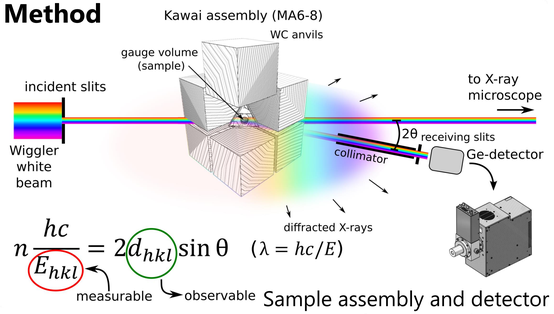
## Applications

| | |
|---|---|
| Phase relations: | Melt viscosity measurements |
| *Transformation/nucleation* | Structure of amorphous materials |
| *Melting curves (solidus/liquidus)* | Ultra-high P (60 GPa) & T (3000 K) generation |
| Equations of state | Ultrasonic wave speed measurements |
| Crystallography | Acoustic Emissions detection |
| Controlled rock deformation | Electrical conductivity (soon) |

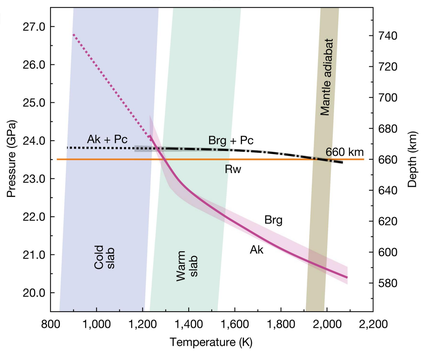
## Method



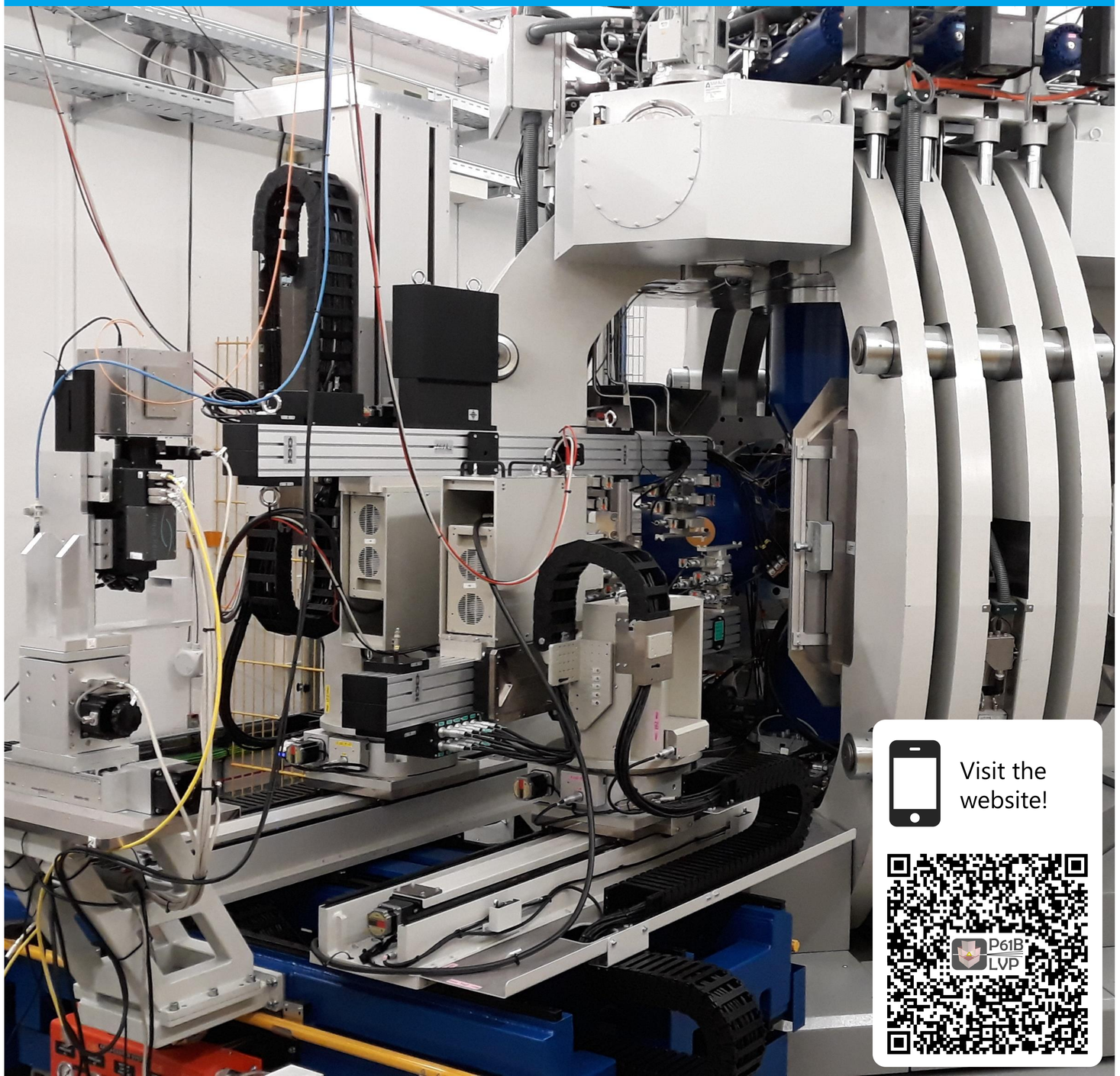

Sample assembly and detector geometry for energy dispersive X-ray diffraction ED-XRD

## Highlight: Depressed 660-km discontinuity caused by akimotoite–bridgmanite transition

Comparison of the key phase transition boundaries determined in this study. **Note: Ak-Brg occurs deeper in cold slabs!**




# Discover the **structure** and **properties** of materials at extreme conditions of **high pressures** and **temperatures** using *in situ* **X-ray diffraction** and **radiography** techniques



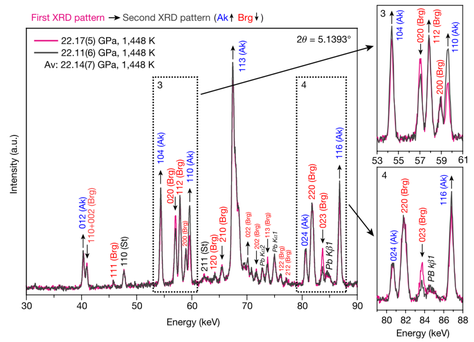

## Beamline P61 specifications

| | |
|---|---|
| Source | 10x wigglers |
| Length (m) | 10 x 4 |
| Period length (mm) | 200 |
| # periods | 10 x 19 |
| Peak field B0(T) | 1.52 |
| Def. parameter K | 28.4 |
| Max. power (kW) | 10 x 21 |
| Usable energy range | 30 – 160 keV (Ge-SSD) |
| Power density | 16 W/mm$^2$ |
| Filtered power | 12 – 10 W/mm$^2$ |
| Peak flux density P61B @ 50 keV | $10^{12}$ ph/s/mm$^2$/0.1% b.w. |
| Max. beam size | 2.2 mm (h) x 1.7 mm (v) |
| Min. beam size | 0.03 mm x 0.03 mm |

## LVP & detector specifications

| | |
|---|---|
| 'Aster-15' mavo press LPQ6-1500-100 | 6 indep. controlled rams |
| Maximum load | 15 MN – 5 MN/axis |
| Ram position control | 1 µm step – 100 mm |
| Oil pressure control | 0.5 bar – 620 bar/ram |
| Anisotropic compression | Axial symmetric, triaxial |
| 5-axis stage | x,y1,y2,z (± 100 mm), rotation: ± 11.5° |
| Combined weight | ca. 45 ton |
| Ge-detector (2x) | Mirion (Canberra) |
| Collimator slit (mm) | 0.03, 0.05, 0.1, 0.2 |
| Receiving slits (mm) | 0.05, 0.1, 0.2, 0.5, 1.0, 2.0 |
| Horz. detector pos. | 1xGe: min 3° - max 20° 2xGe: min 3° - max 10° |
| Horz. & vert. pos. | $Ge_{vert}$: min 7.5° - max 23° $Ge_{horz}$: min 6.5° - max 10° |

## P61B XRD data from highlight (left)




Accurate phase identification by means of *in situ* X-ray diffraction in the Aster-15 LVP.

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