

WIR SCHAFFEN WISSEN – HEUTE FÜR MORGEN

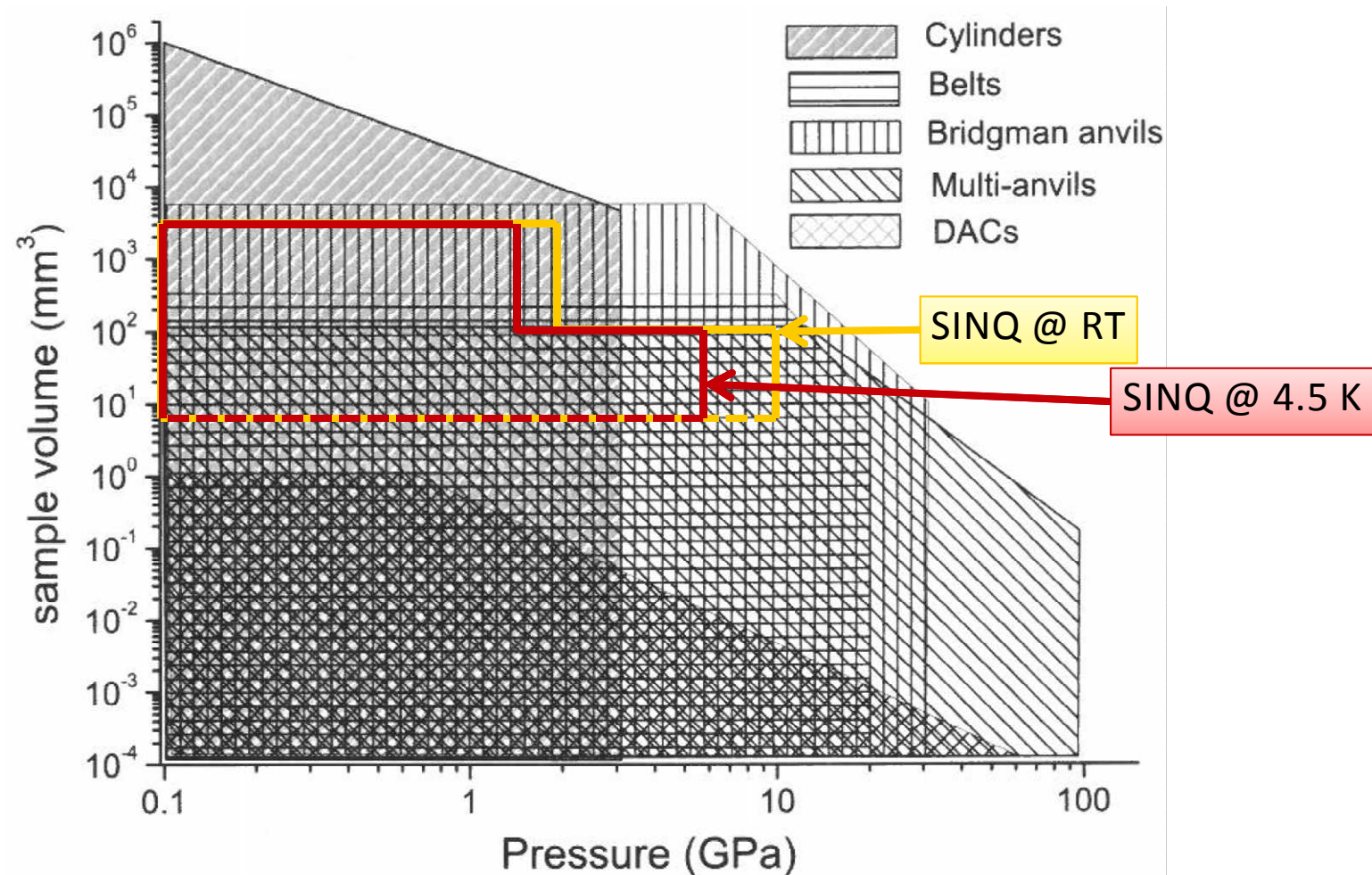


Neutron pressure cells at SINQ, PSI

jonathan.white@psi.ch

March 2016

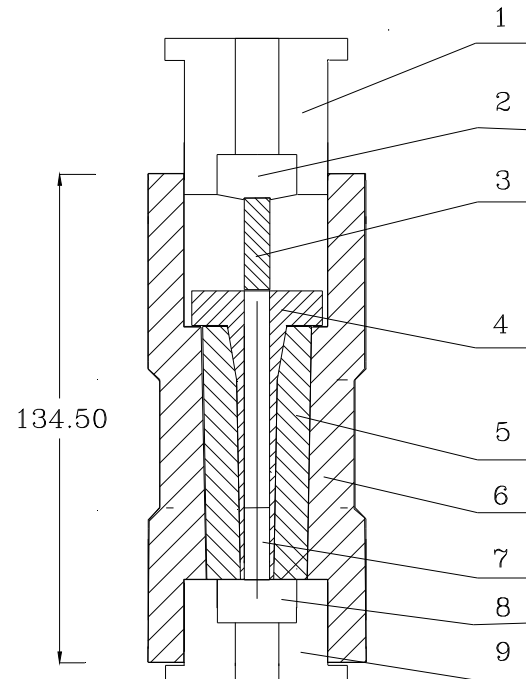
Neutron Pressure Cells @ SINQ



S. Klotz, "Techniques in high pressure neutron scattering", 1st Ed., CRC Press, (2013)

Standard clamp cells - I

12 kbar cell for inelastic neutron scattering / single crystal wide-angle diffraction



1,9.-Nuts, steel

2,8.-Pistons support, steel

3,7.-Pistons, steel and WC

4.-Insert1, hard steel

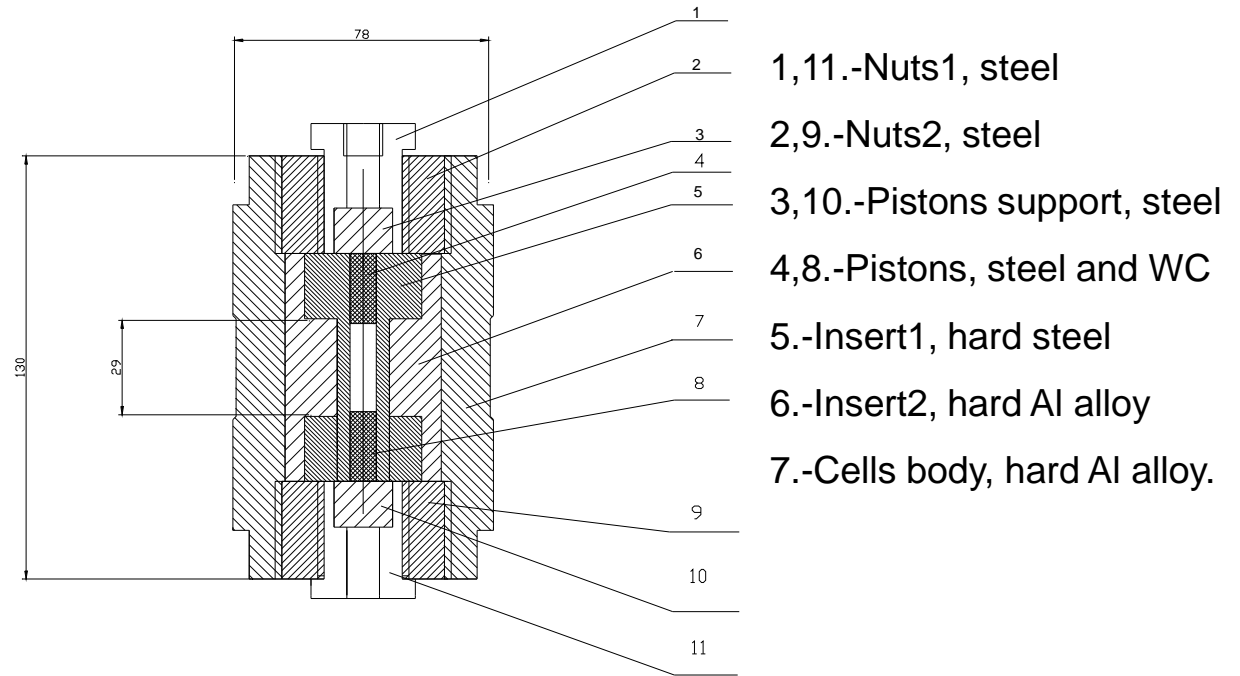
5.-Insert2, hard Al alloy

6.-Cells body, hard Al alloy.

- T down to 1.5 K (then 8 kbar max P)
- Outer diameter = 55 mm
- Inner diameter (for sample) = 7.4 mm
- Weight = 1.6 kg

Standard clamp cells - II

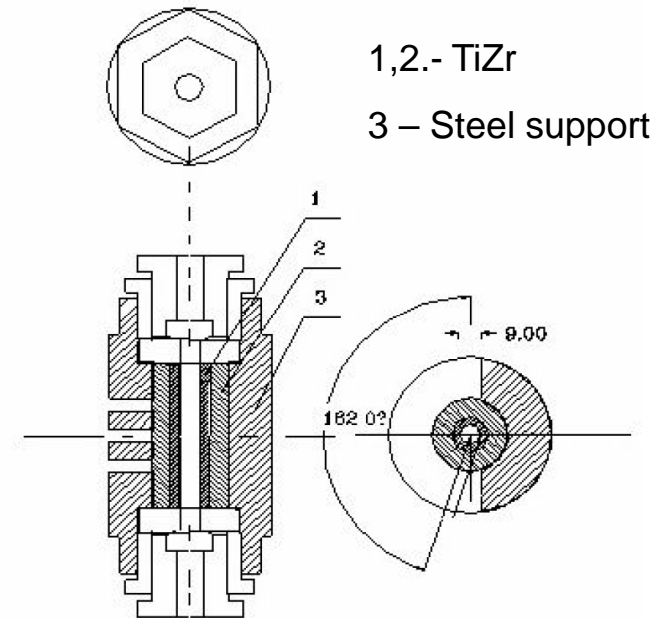
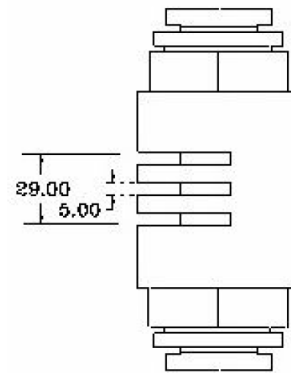
17 kbar cell for inelastic neutron scattering / single crystal wide-angle diffraction



- T down to 1.5 K (then 15 kbar max P)
- Outer diameter = 78 mm
- Inner diameter (for sample) = 7.8 mm
- Weight = 2.6kg

Standard clamp cells - III

Workhorse **15 kbar** cell for neutron powder diffraction



- T down to 1.5 K (then 12-14 kbar max P).
- Outer diameter = 78 mm
- Inner diameter (for sample) = 8 mm
- TiZr 'null-scattering' alloy

Nonmagnetic Clamp Cells

10 kbar cells for inelastic neutron scattering+diffraction,

Al outer - CuBe/NiCrAl inner

Cell with CuBe insert ok for SANS



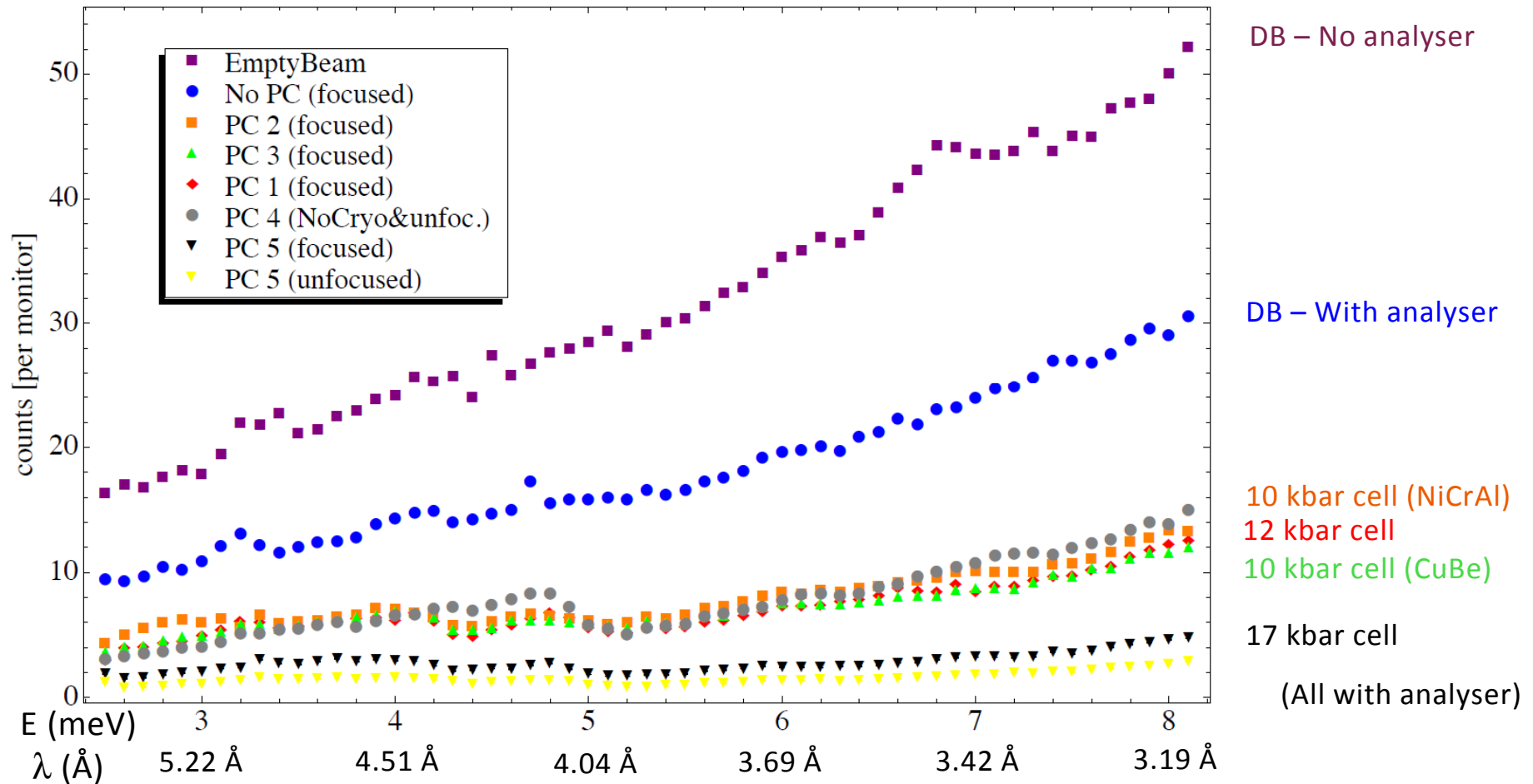
- T down to 1.5 K (then 7-8 kbar max P).
- Outer diameter = 46 mm → fits 9T vertical and 7T horizontal field magnets.
- Inner diameter (for sample) = 8 mm
- Each weighs 0.6 kg.

10 kbar cell for diffraction,
All TiZr



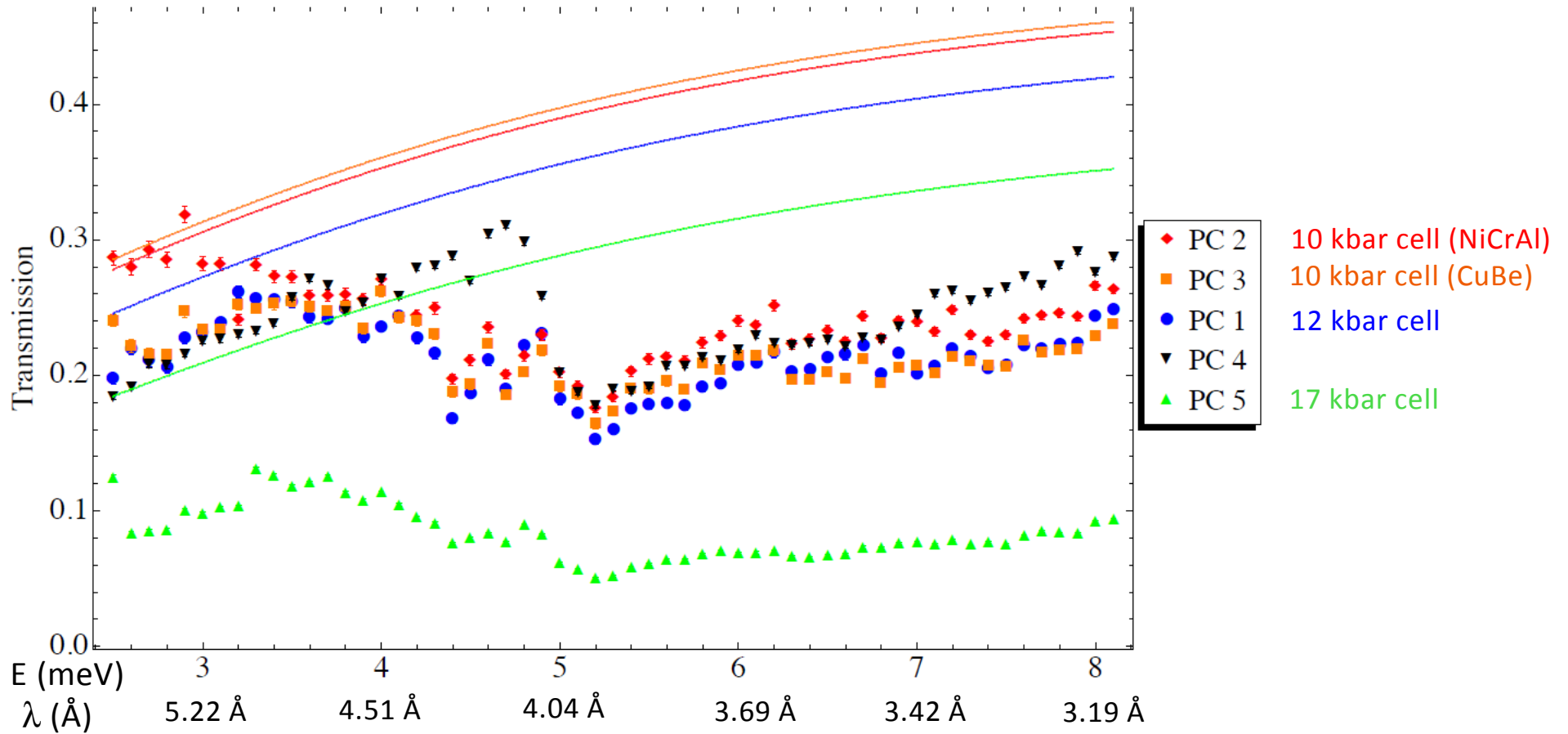
- T down to 1.5 K.
- Outer diameter = 28 mm → fits various magnets.
- Inner diameter = 6 mm.

Transmission of spectroscopy cells (I)



Courtesy: S. Allenspach

Transmission of spectroscopy cells (II)



Courtesy: S. Allenspach

7 kbar pressure ramPTMs – H-free!

- Mix of deuterated methanol and ethanol (4 parts methanol : 1 part ethanol)
- Various Fluorinerts of reducing stock – FC-75 and FC-77 no longer available
- Deuterated glycerol - \$\$\$

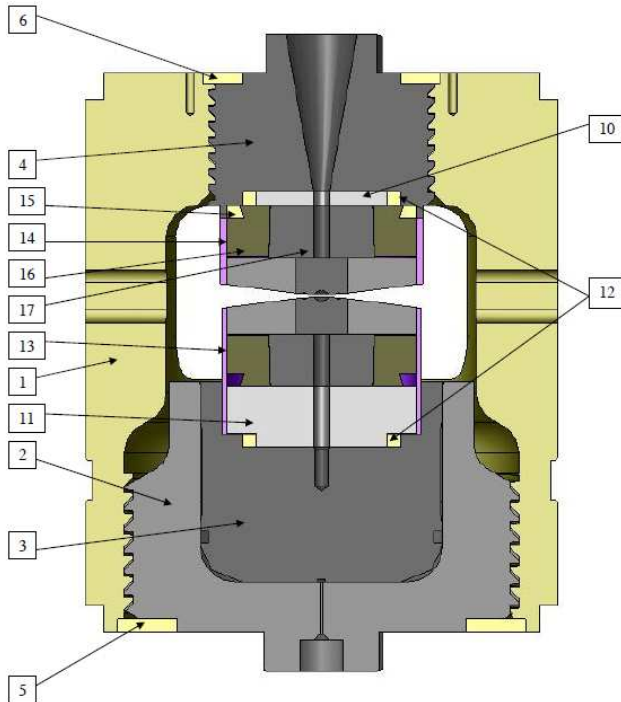
Opposed anvil techniques

Neutron absorbing cBN anvils

TiZr or CuBe gaskets

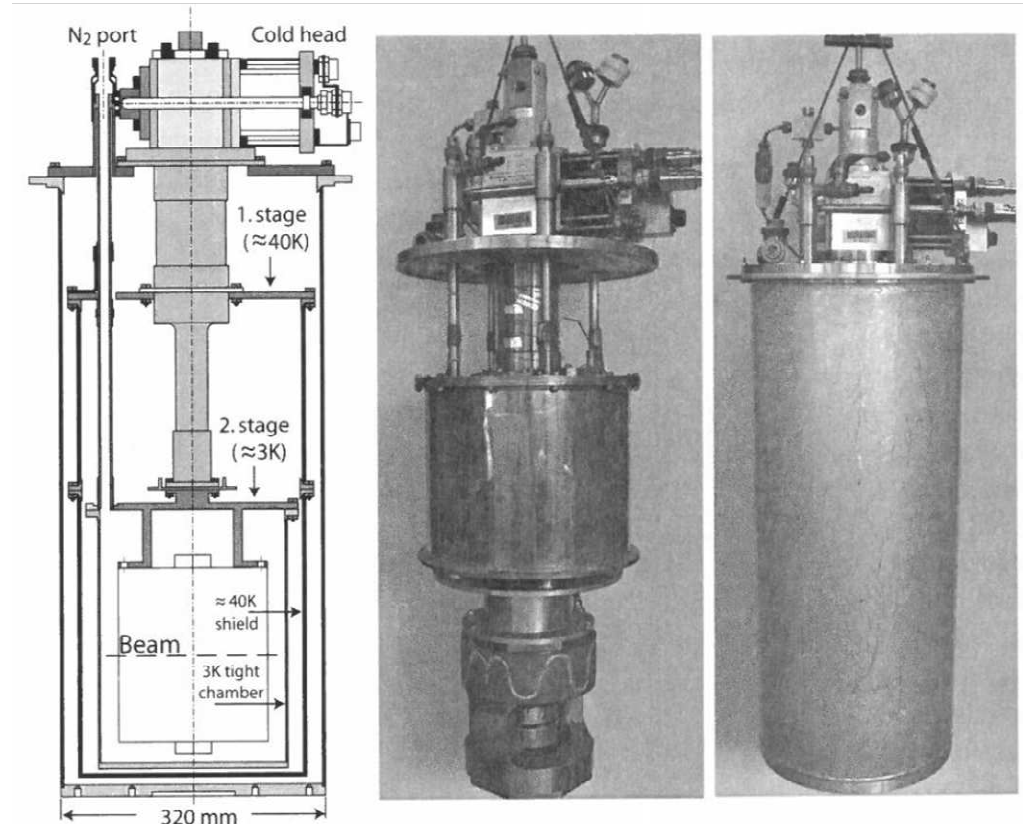
Dedicated cryocooler

PE cell mass is 30kg



Druck auf Probe
Kraft auf Probe
Hydraulik, Pneumatik
Probengröße
Material Presse
Material Stempel
Material Gasket
Druckmedium (Probe)
Hersteller

max. 200 kbar (200'000 atm)
max. 160 tn (1 Airbus A330-200)
max. 2000 bar (Öl oder He-Gas)
30 – 100 mm³
hochlegierter Stahl (AW819)
Bornitrid oder synth. Diamant
Titan-Zirkon Legierung
Methanol:Ethanol Gemisch, Fluoriniert
M.G.63 (Frankreich) / Université Paris VI



Mostly used for neutron powder diffraction

Single crystal option available

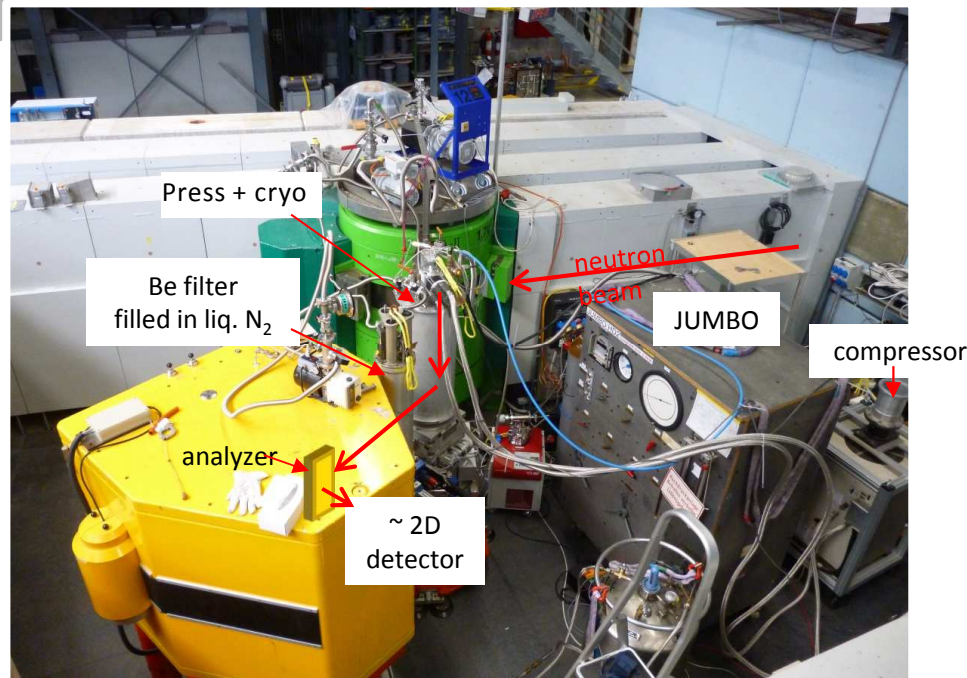
Sample volume: 30–100 mm³

Paris-Edinburgh Press II

Low temperature mode

Sample P (He gas) up to 10 GPa

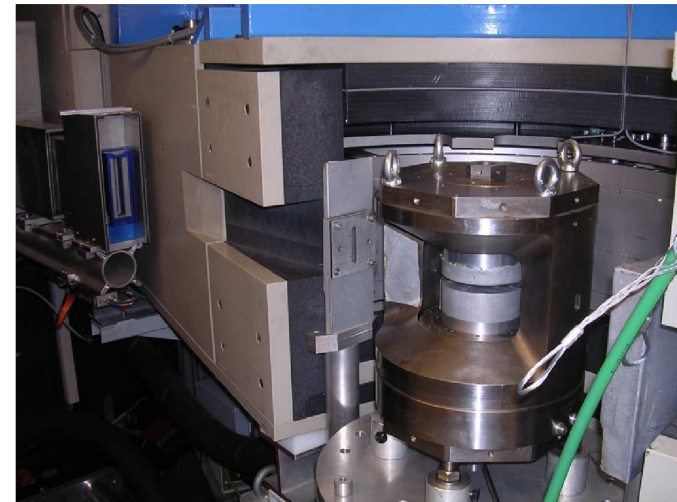
T down to 4.5 K (max P = 5 GPa)



Single crystal mode @ RITA-II

Room temperature mode

Sample P (oil) up to 10 GPa



@ HRPT

LNS Pressure People

Clamp cells for spectroscopy and
single crystal diffraction

Paris Edinburg Press

Jonathan WHITE



Clamp cells for powder diffraction

Denis CHEPTIAKOV



SQUID cell

Alun BIFFIN



New initiatives, gas cell (?), moral
support..

Christian RÜEGG

