



6 partners:

Participant short name	LLB CEA	HZB	JCNS	ILL	TUM	STFC

4 tasks:

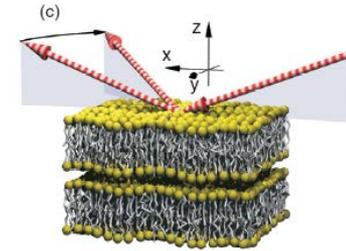
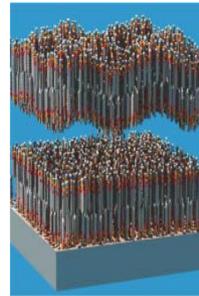
- Platform for model biological membranes **Task 1**
- Kinetic & Dynamics experiments **Task 2**
- Humidity chamber with sample changer **Task 3**
- Cryogen free cryostat with sample changer **Task 4**

Optimization of model bilayer systems including natural membrane lipids

Basic requirements of model Bilayer for reflectivity:
large and uniform membrane

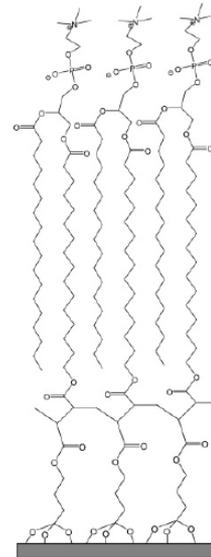
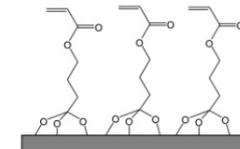
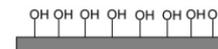
Solution - 'Floating' Bilayers..

Works – But.. only for the simplest lipids
Need to hold lower 'support' more firmly.



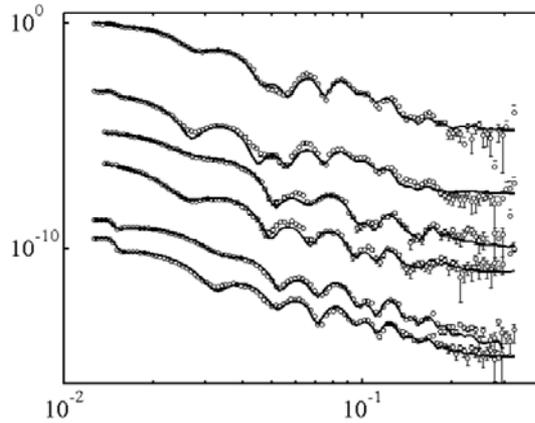
Solution – Grafted phospholipid on Self Assembled Monolayers

Fabrication of membrane of more complex mixtures

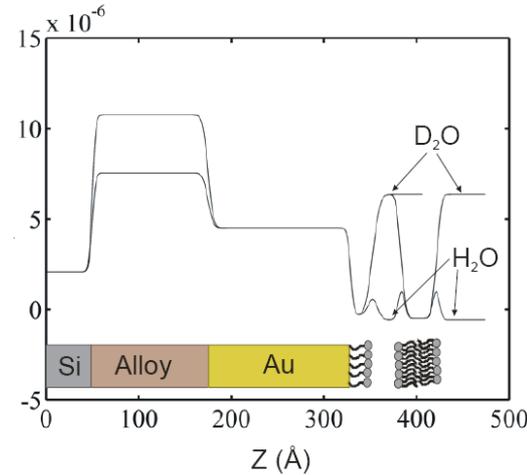


Latest developments – Gold/Thiolipids

STFC



100% coverage



Hughes et al.

Developed novel LB technology for accurate positioning of substrates.

MD and MC simulations of membrane profiles (STFC)

Fully deuterated natural lipid membranes

Yeast cells grown in a deuterated medium (D-lab)

Lipids extracted with Folch method

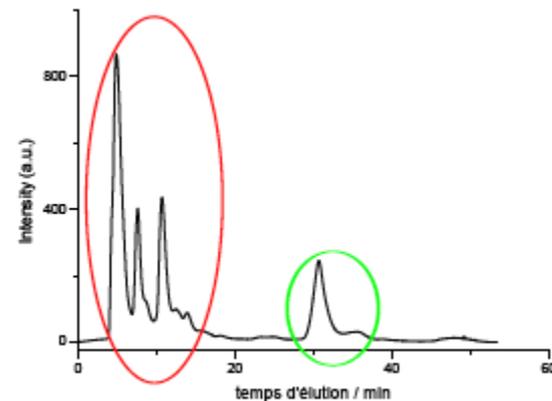
Phospholipids separated by 2D TLC

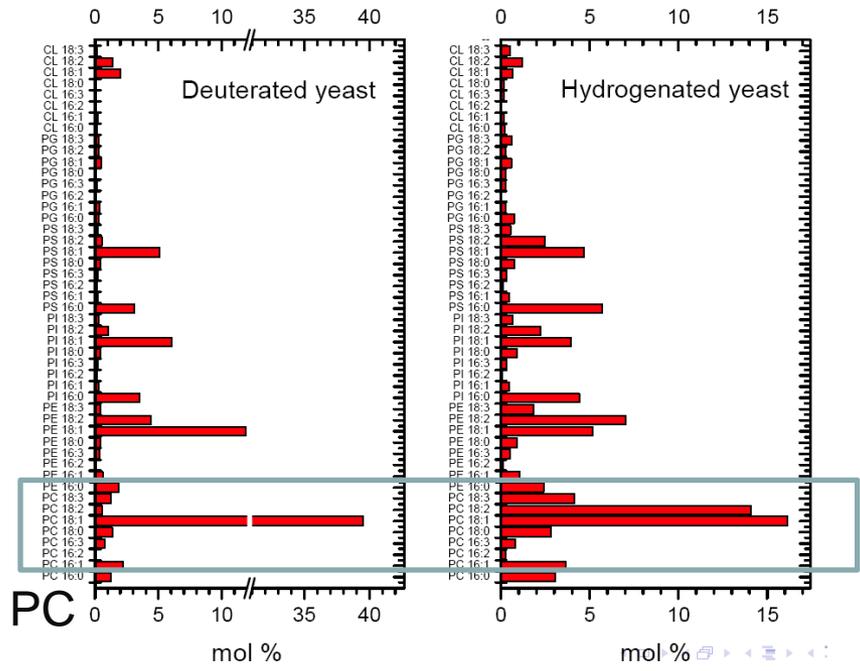
Lipids separation (HPLC):

Apolar lipids (chloroform-acetic acid)

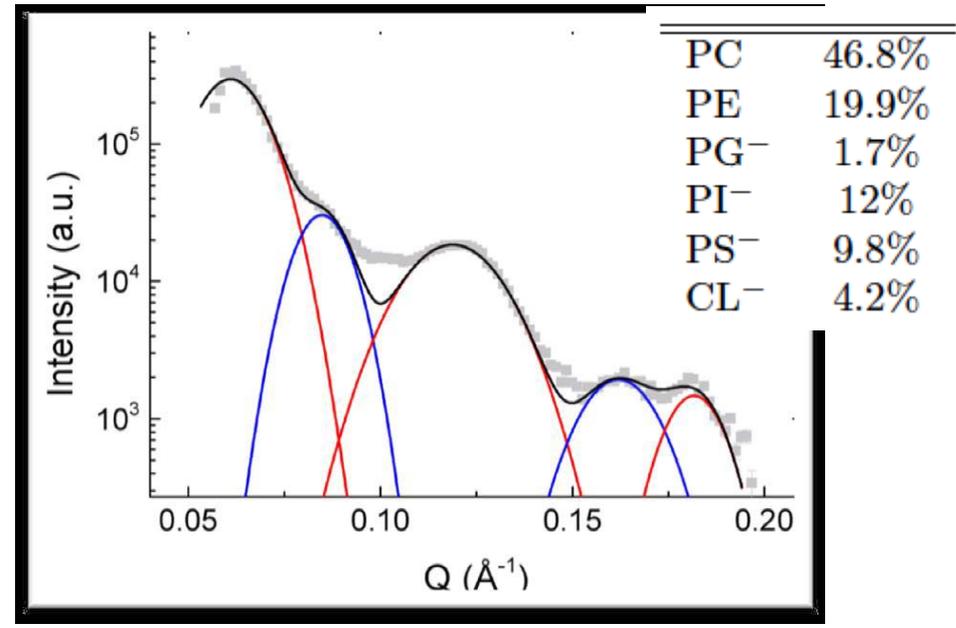
Polar lipids (methanol)

Separation of sterols from apolar





Neutron Diffraction from P. Pastoris

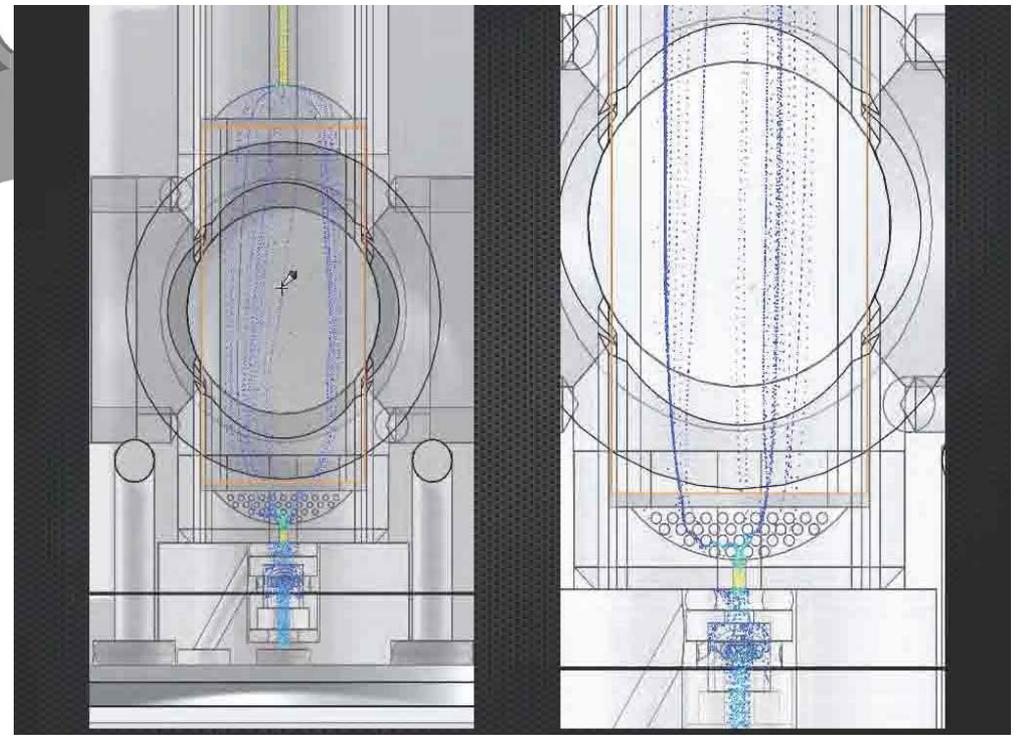
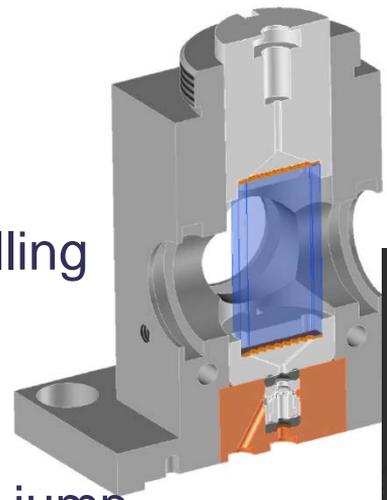


Gerelli et al.

D lipids synthesis depends on the T° of growing media
 Vary the T° (RT or 30°C)

New observation heads for Stop Flow ILL

- Improve the cell filling (homogeneity, duration)
- New furnace for T-jump.



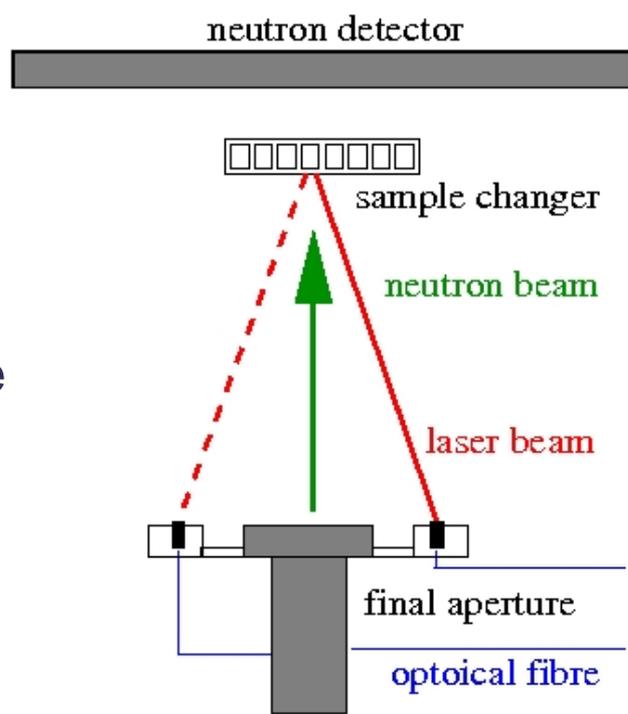
Started to study the cell filling by changing the solution injection device (bottom of the SF head)

A combined static LS DLS and SANS

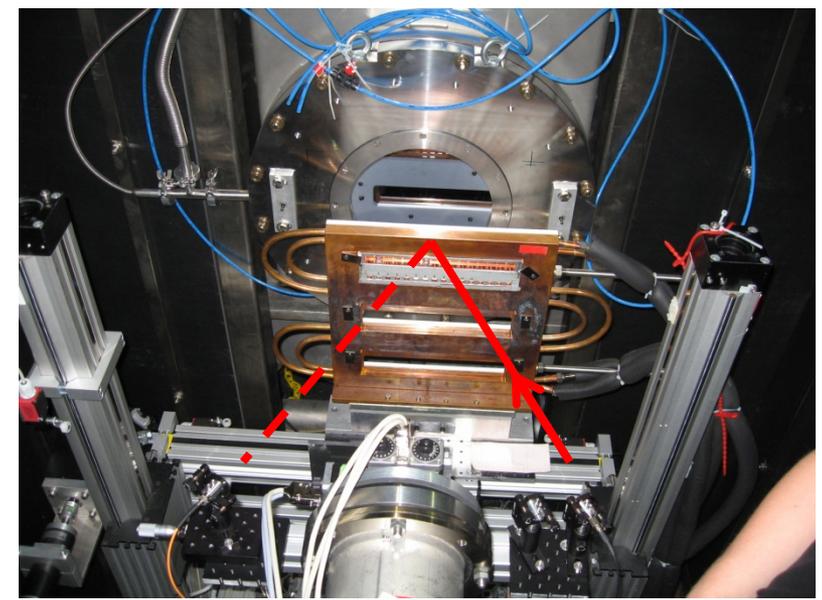
Implement DLS ... with the flow-through cell of the stopped flow ...

LS in fiber configuration permanently fixed on the SANS collimator exit

JCNS



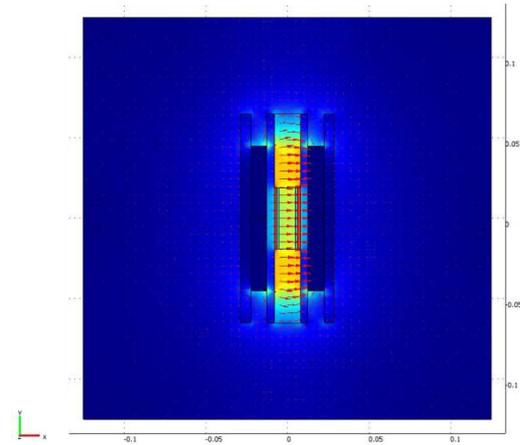
advantage:
possible to
use sample
changer



DLS Tests

Electric field cell with electrodes outside the sample

LLB



Comsol simulation

Build a prototype

Effective electric field measurement (probe inside the sample)

Vary the permeativity of samples (solvents) and materials around the sample cell

Next step : Comparison tests measurements/ Simulations ComSol,
New design with thermalization

Pressure cell for Neutron Spin Echo

Sample area: ca. 3x3 cm²

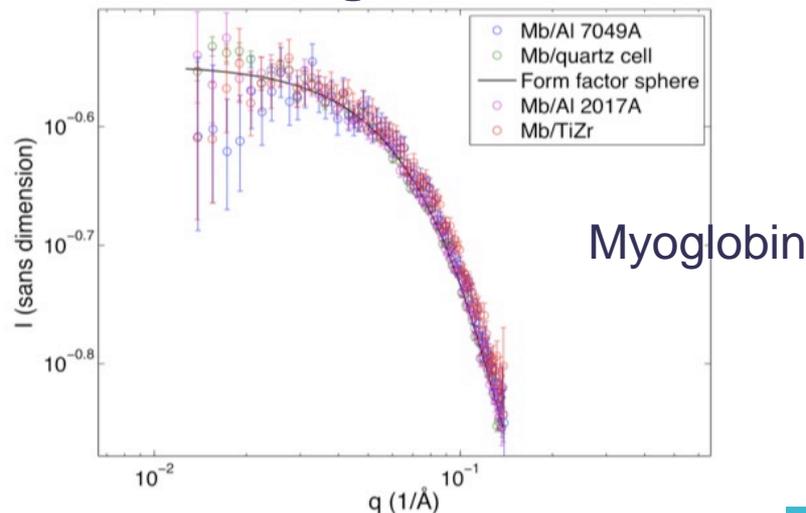
Thickness: ca. 2mm

Pressure: 10 kbar (if possible)

Sapphire or alloys windows? Which geometry?

Tests in SANS with sapphire : cell broken (ILL) , leaks (JCNS)

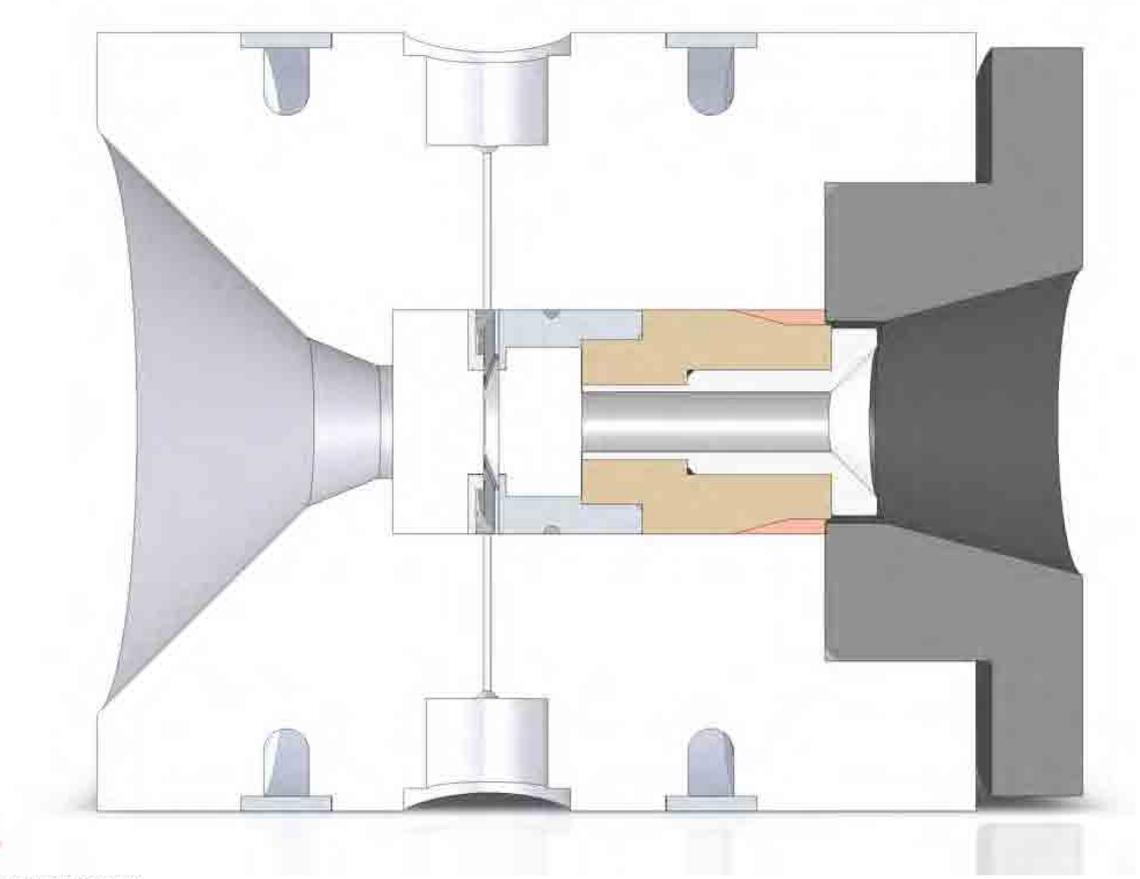
Tests of windows at LLB in SANS, Q Range of NSE



A new pressure cell for SANS up to 7kbar

Begin the design phase

ILL, LLB, JCNS





nmi3



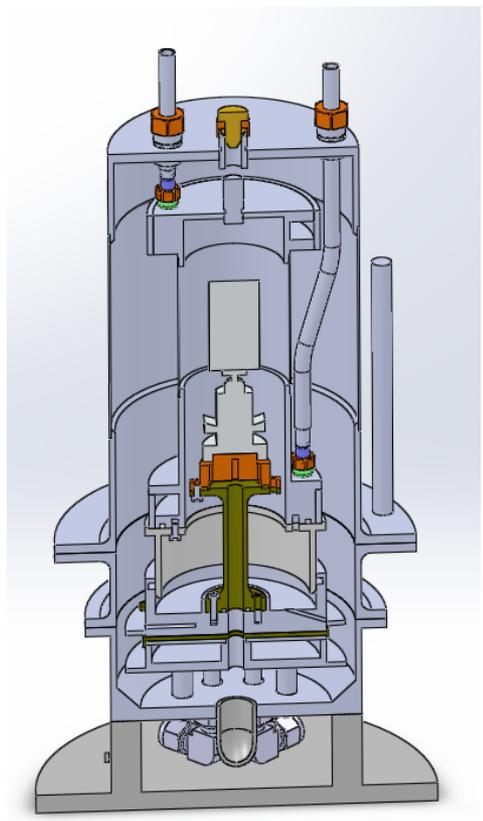
Humidity chamber Task 3 w

HZB, LL

End of design phase

- Double walled (evacuated) Al
- Total size=400xØ110 (270 mm from base to sample)
- Inner cell=220xØ50 (170 mm above cold chamber region) , small volume for fast equilibration
- Wide angular scanning range possible (~300°), neutron windows with 15° opening
- 3 water chiller channels for precise temp.
- 2 resistive heating foils possible (below gonio and below reservoir)
- Sample cell thermally isolated (plastic post, steel supports),

Final inner can



Next step: manufacture, assembly -> 06- 2014 1st tests end 2014



nmi3

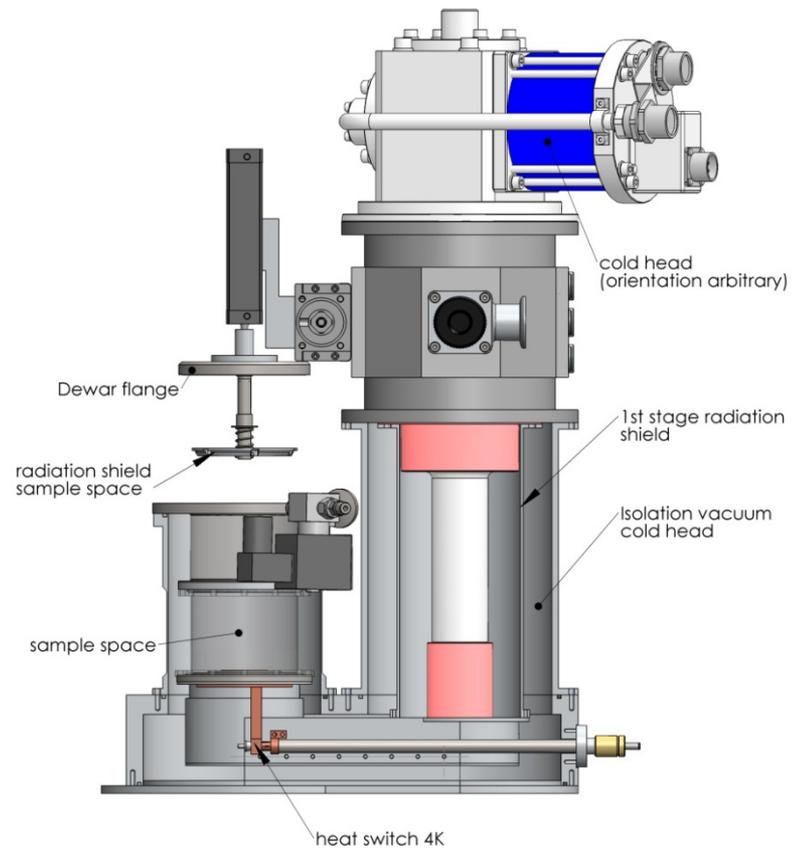


Cryogen-free cryostat with sample changer Task 4

■ Compact cryostat

FRMII

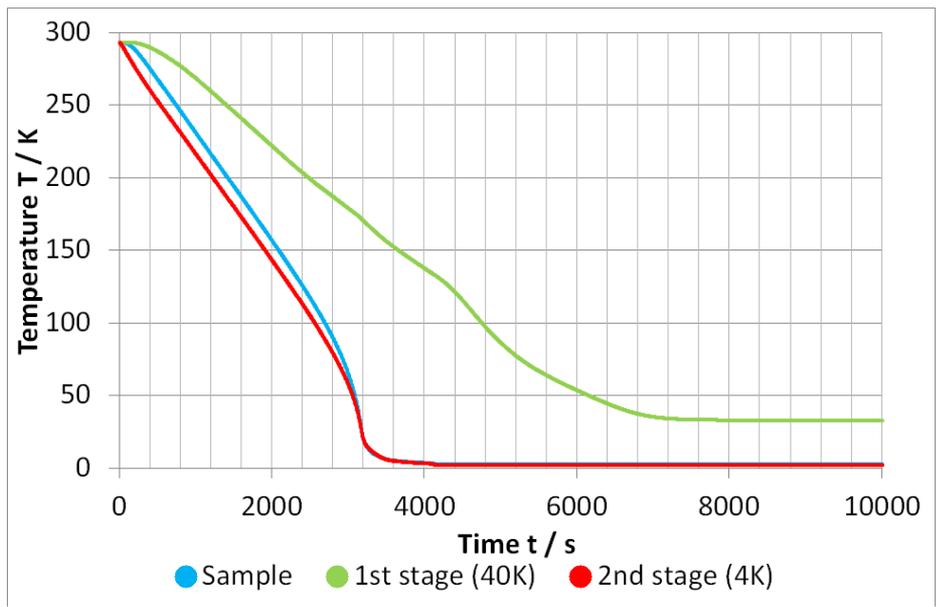
- Separate sample space and cold head isolation vacuum
- Minimized cold mass
- Sample in exchange gas via sample container



Cryogen-free cryostat with sample changer Task 4

1st tests: Cooling

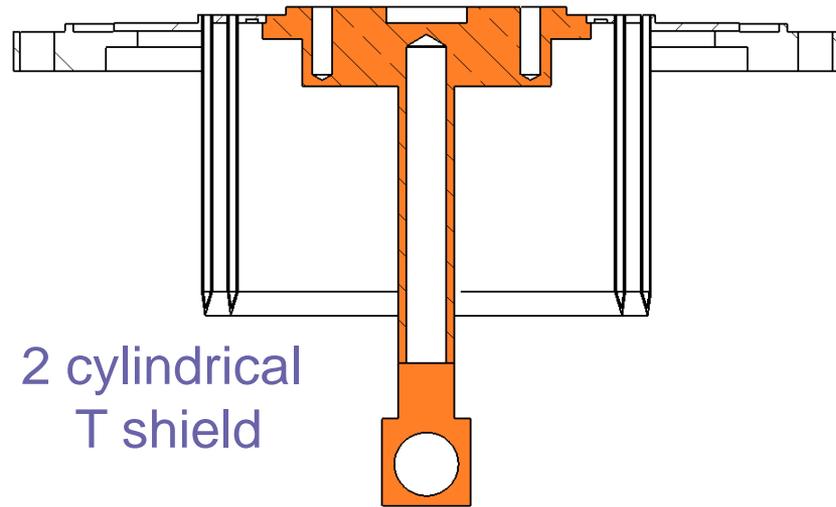
Sample holder thermally decoupled



1:25 h: 2nd stage at $\sim 2,4$ K
 2:40 h: Sample at $\sim 2,8$ K
 (1:30 h: Sample at $\sim 2,9$ K)
 $\Delta T \approx 0,4$ K

Heat management change

New sample holder



2 cylindrical
T shield

Length = 75mm–150mm

Next...

New tests

- Thermal connection of sample
 - ◆ Pin connection
 - ◆ Standardised sample cans (orbital laser welding)
- Automation of the sample exchange
 - ◆ Control of the heat switches
 - ◆ Robot arm



nmia3



WP20

Next meeting in 2014

At ILL in May 2014

*At the 8th International Workshop on Sample Environment
Oxfordshire, 12th– 16th October 2014
Hosted by ISIS STFC*

Possible change of MM distribution

For the pressure cell subtask ILL, JCNS and CEA (LLB)
Decision mid 2014