

Travels with an itinerant magnet: Bringing specialised equipment to facilities

Alex Holmes

Advances on Sample Environment and Experimental Control

Lund

September 10-11, 2015

www.europeanspallationsource.se

Acknowledgments



UNIVERSITY OF
BIRMINGHAM

Elizabeth Blackburn
Alistair Cameron
Ted Forgan
Louis Lemberger
Josh Lim
Jon Perrins
Randeep Riyat
Lingjia Shen
Gary Walsh

PAUL SCHERRER INSTITUT



Marek Bartowiak
Jorge Gavilano
Mark Laver
Joachim Kohlbrecher
Jonathan White
Markus Zolliker



Dave Bowyer
Charles Dewhurst
Ken Honnibal
Eddy Lelièvre-Berna
Paulo Mutti
Ralf Schweins



Steve King
Andy Church
Paul Frodsham
Dave Bunce
Richard Down



Anke Watenphul
Martin von Zimmerman
Ute Ruett
Olof Gutowski



Sebastian Muelbauer
Andre Heinemann



Wolf-Dieter Stein
Oleg Prokhnenko

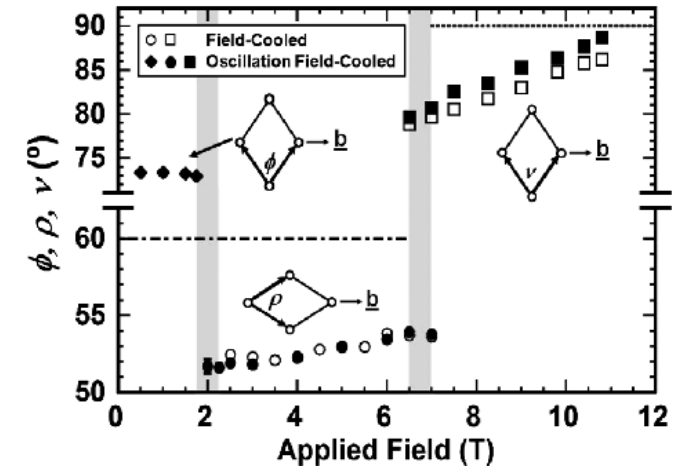
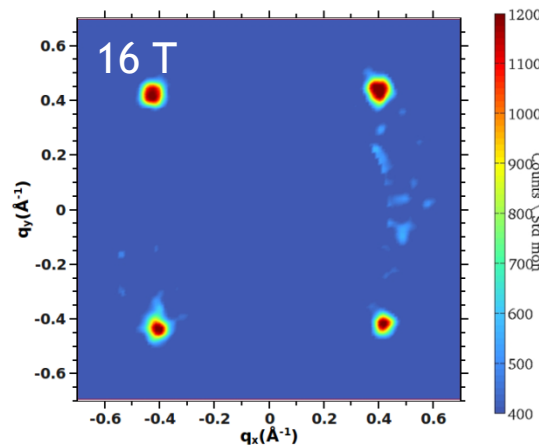
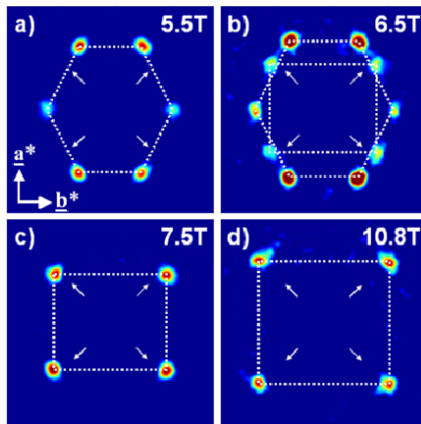


Marc Savey-Bennett



Engineering and Physical Sciences
Research Council

Scientific Motivation: Why do we need SANS at high fields?



YBCO

J.S. White *et al*, PRL 102, 097001 (2009)

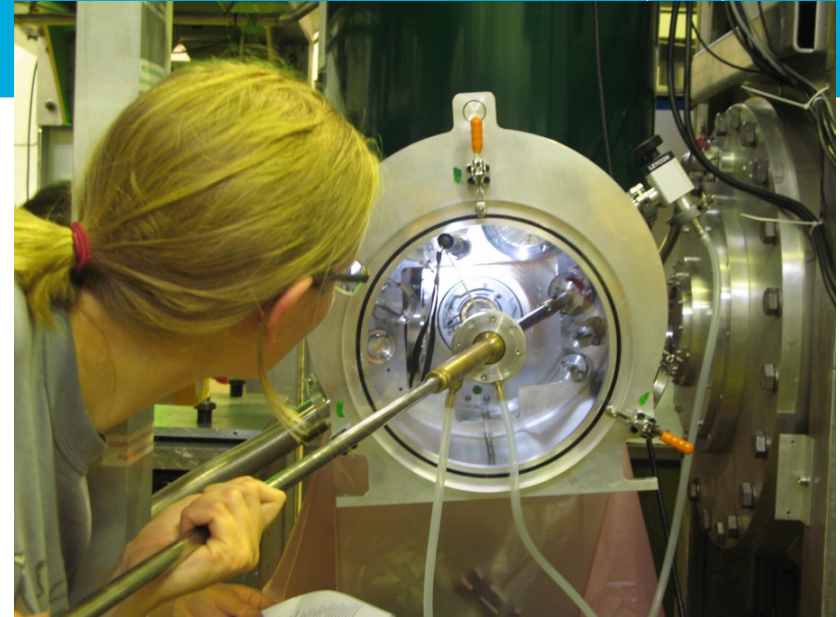
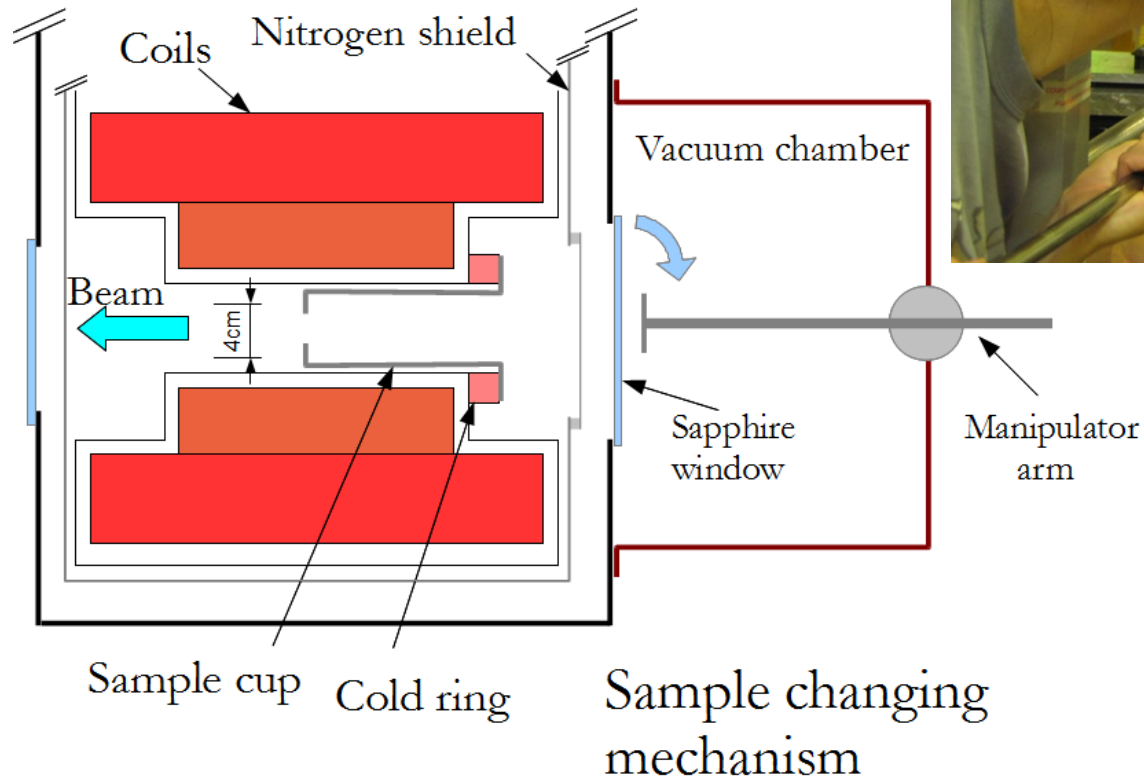
- Flux lattices in clean high- T_c superconductors give information about pairing and Fermi surface.
- Flux lattices commonly studied using Small Angle Neutron Scattering (SANS)
- Evolution seen up to and beyond previous limit of 11 T.
- Ambient conditions – alignment of anisotropic particles

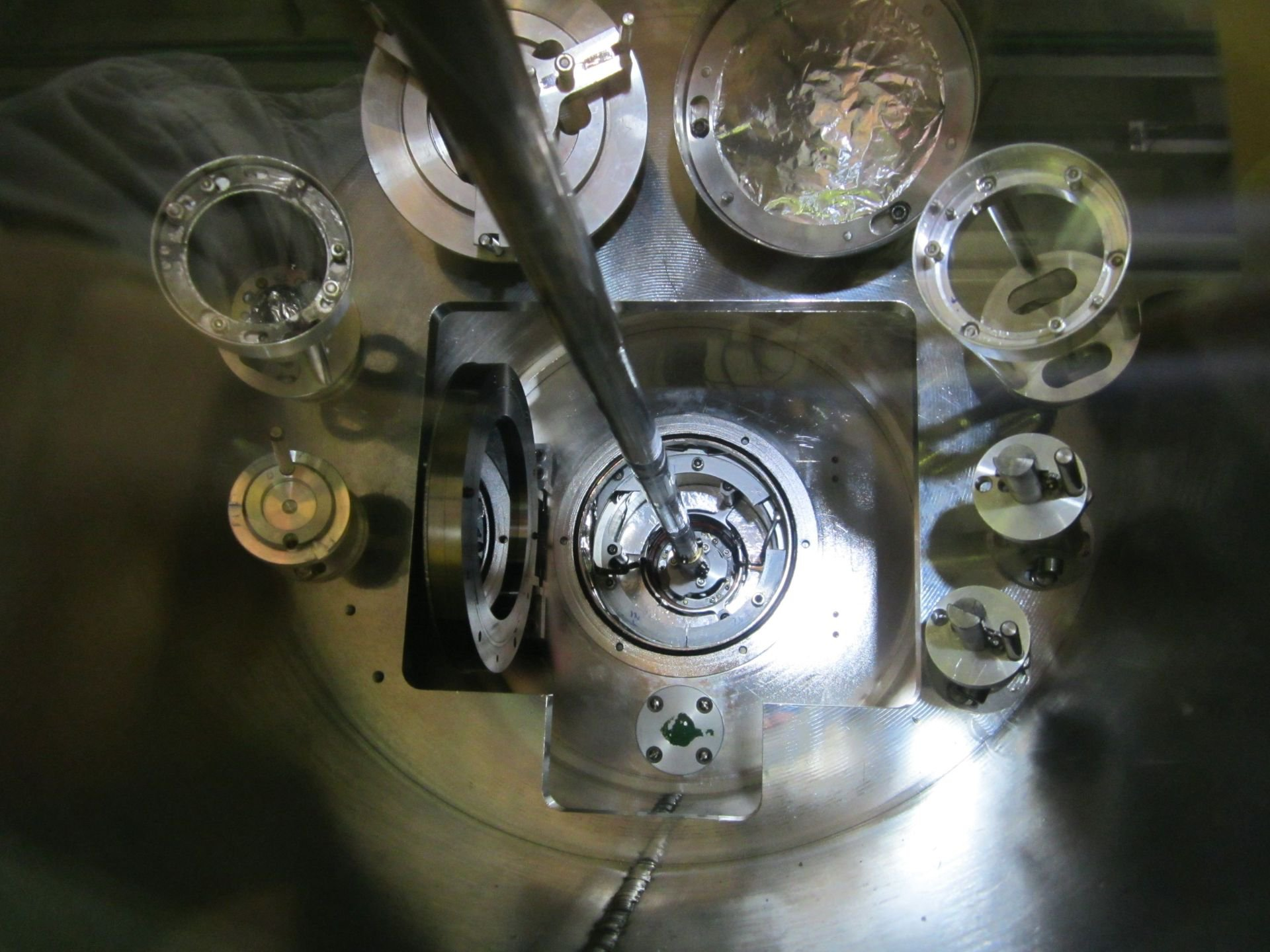
The Birmingham 17 T magnet for small angle neutron/X-ray scattering

- Max field 17 T, parallel to beam
- Temperatures 1.6 K – 300 K (50 mK to come)
- $\pm 10^\circ$ access entry and $\pm 11^\circ$ exit
- 0.1% uniformity in B over 1 cm^3
- In-situ sample change (by trained operator)
- Room temperature access to bore (with additional insert)
- Very low background
- Fast cooldown (~ 20 mins 300K to base) and field ramp (40 mins to 17 T)
- 400 kg with cryogenics
- Labview running on PC with RS232 connection to facility

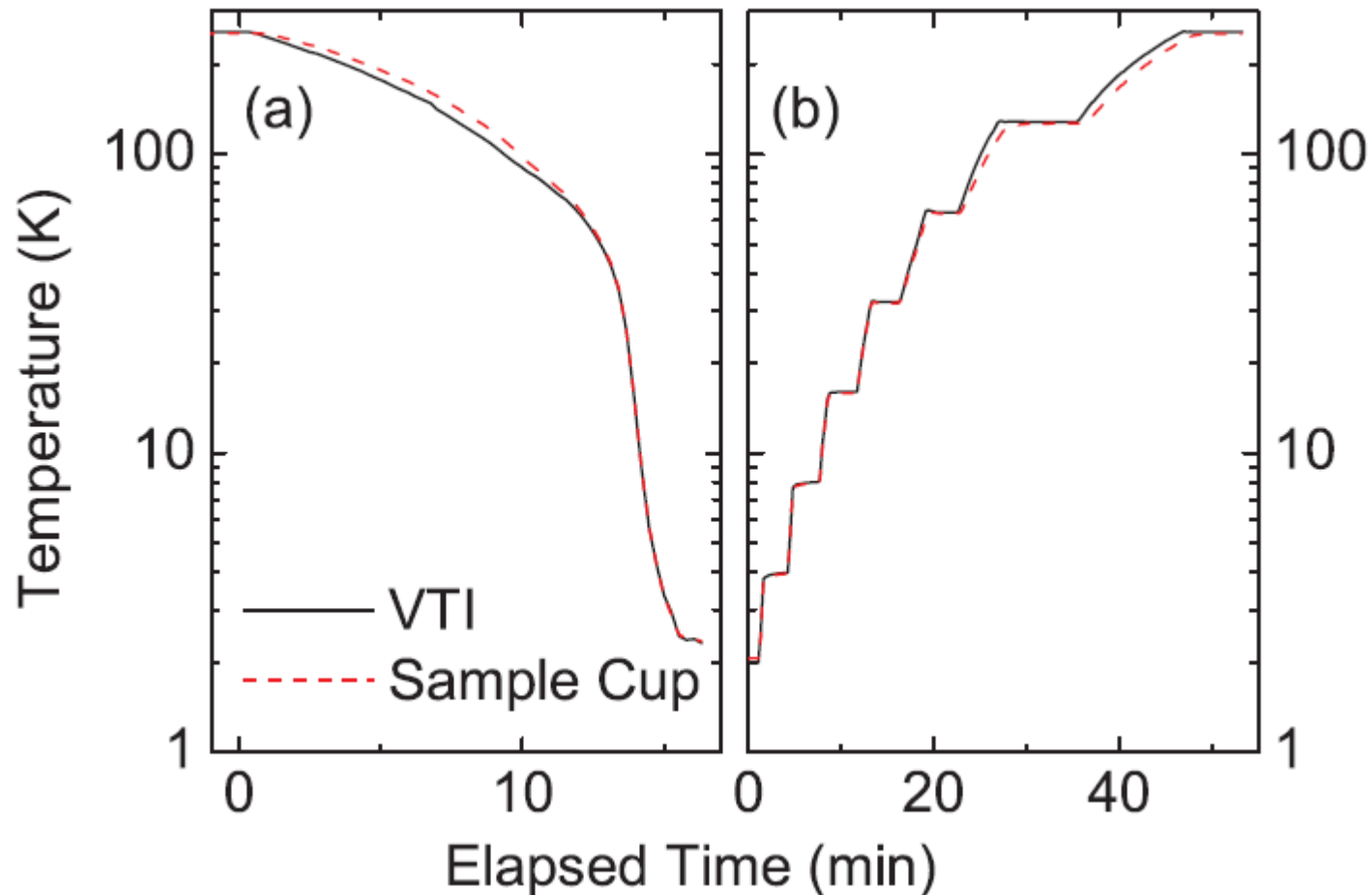


Sample change is possible with magnet cold

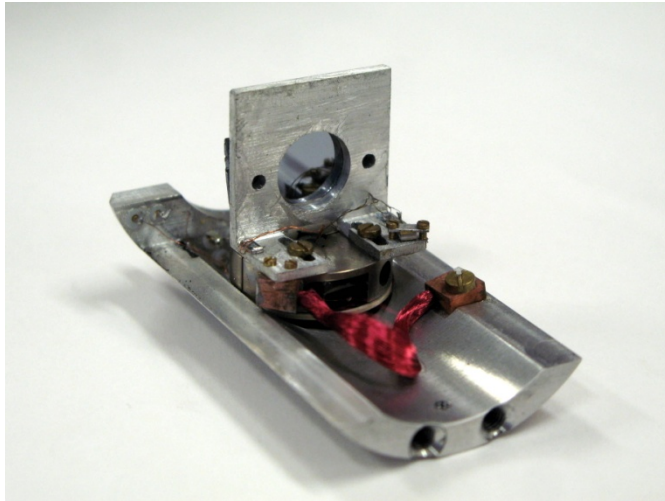




Fast cooldown and thermal response

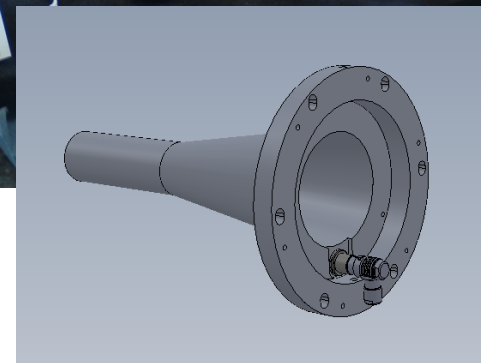
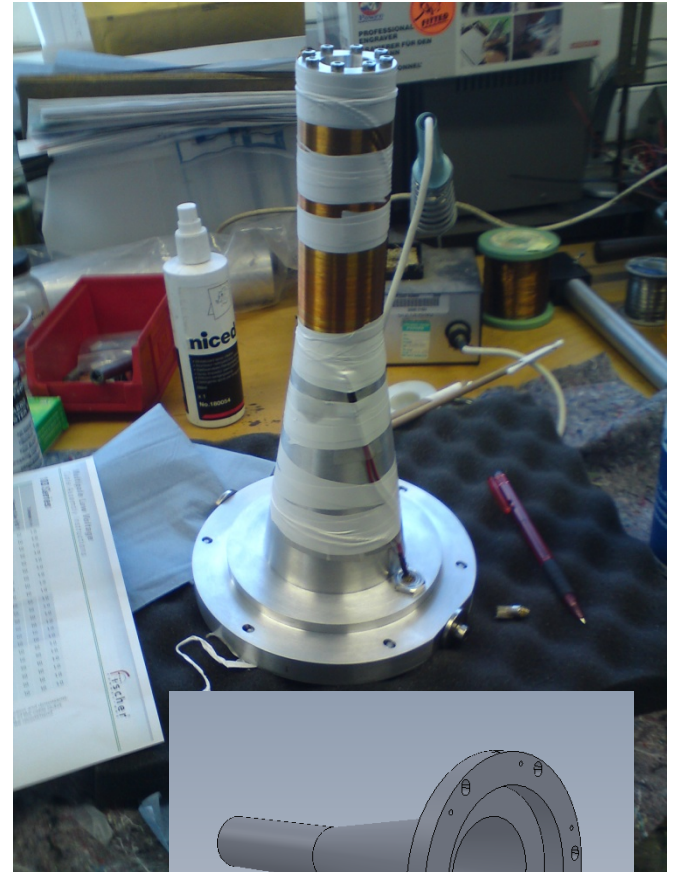


Rotation stage and room temperature insert

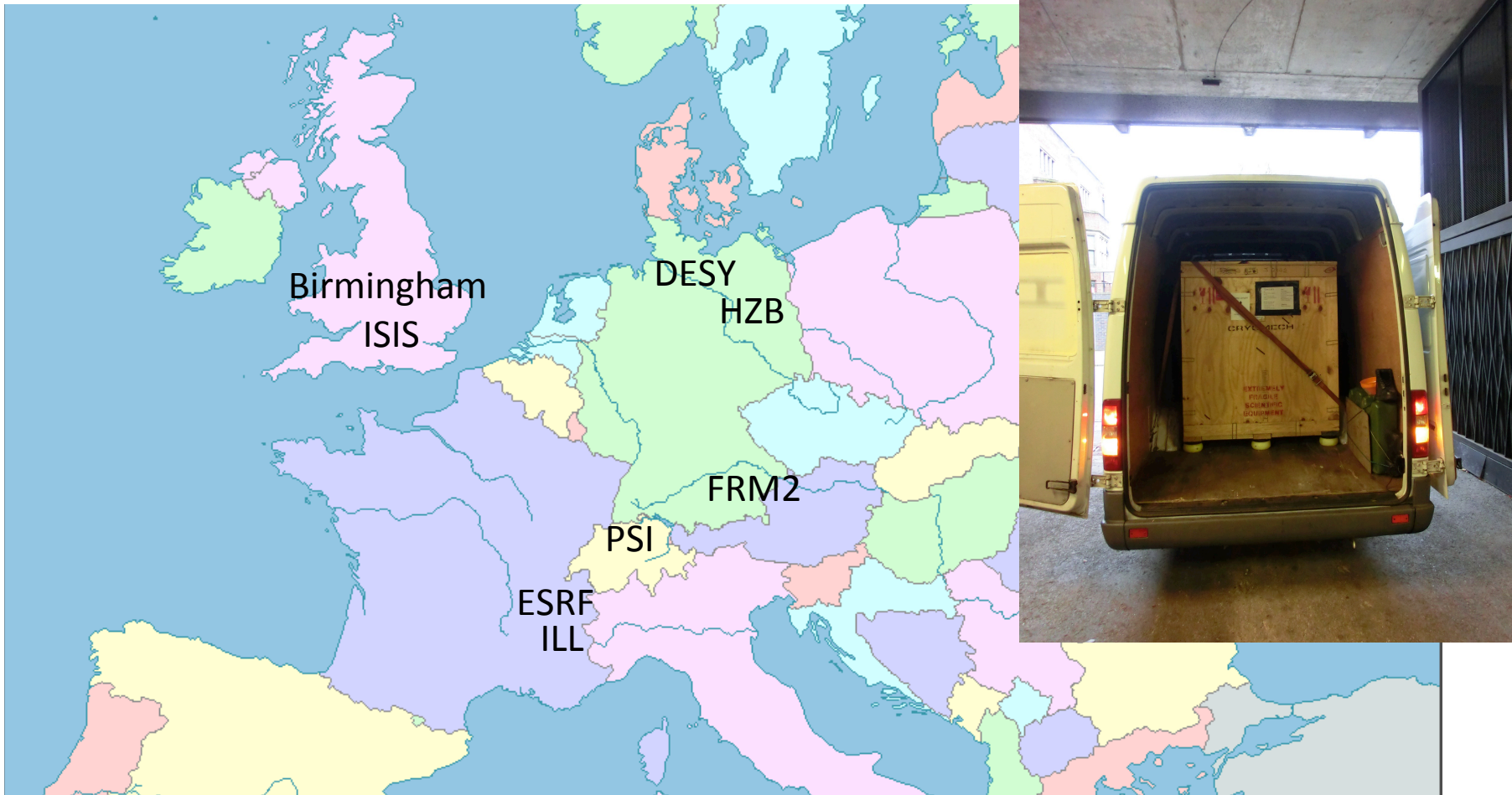


Room temperature insert:

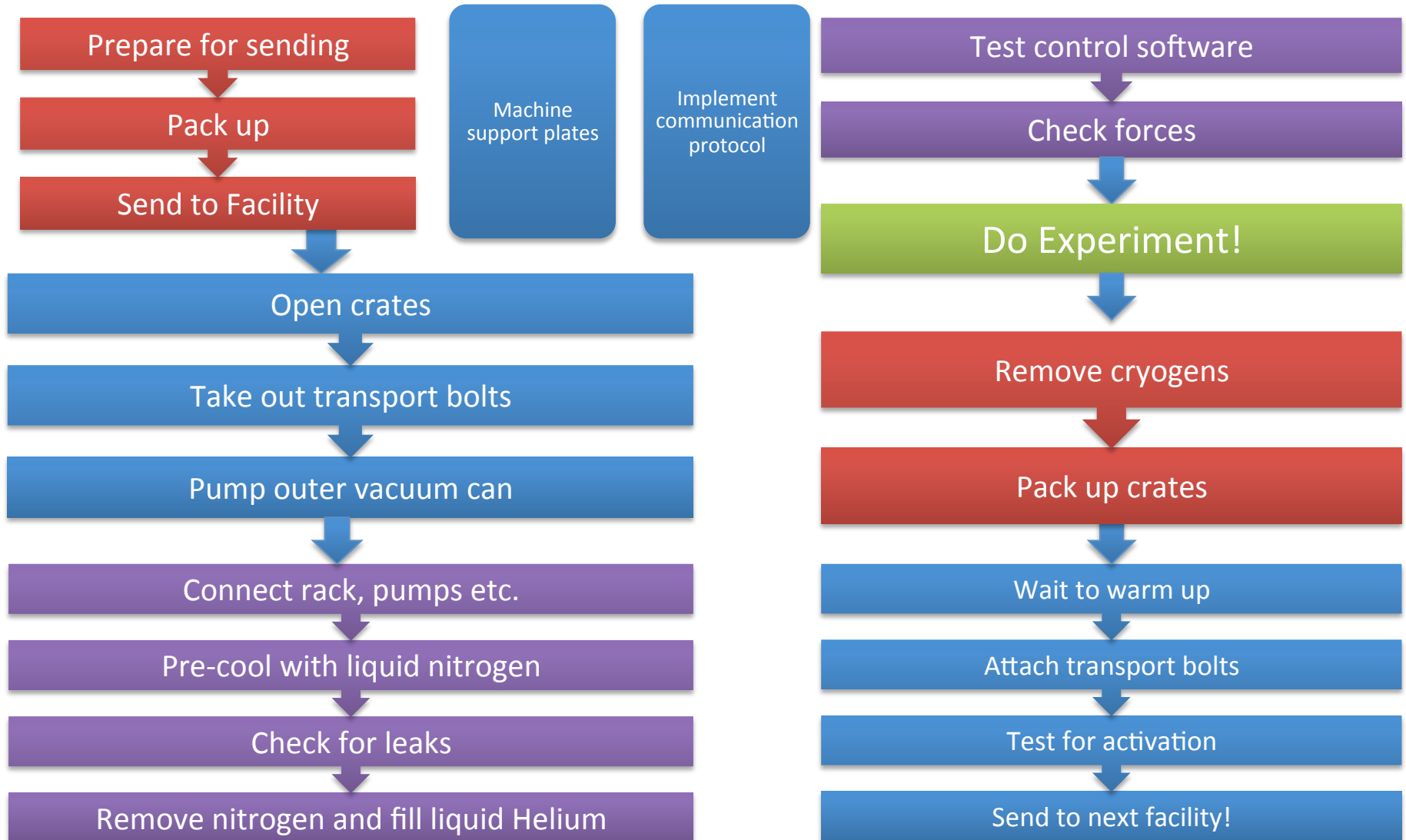
- $\pm 7^\circ$ entry access
- Temperature controlled 10-50 °C
- Sample change possible at 17 T



Where have we been?



How to do an experiment at a new facility



Critical factors for success:

- Interactive relationship with manufacturer
- Cooperation from facilities
- Close interaction with facility software people
- Close interaction with beamline scientists and technicians
- Expert users (us)
- Collaborations with other users



Thanks for your attention!