



**20 Years of Sample Environment:
Men and Machines – 1988 to 2008**

A history tour with Michael Meißner's picture book

Temperature

ILL: Serge Pujol, Frederick Thomas, Paul Dagleish ...

AS: Collin Hillier, Paul Wiggins, Richard Heather ...

CEA Saclay: Patrick Pari

Ol: Herbert Albrecht, Andrew Forbes ...

1988 - 1991: Upgrade of BER-II to 10 MW



BENSC-SE service started with ILL equipment - build by AS Scientific

1st edition in 1996: The colored book

Hahn-Meitner-Institut
Berlin

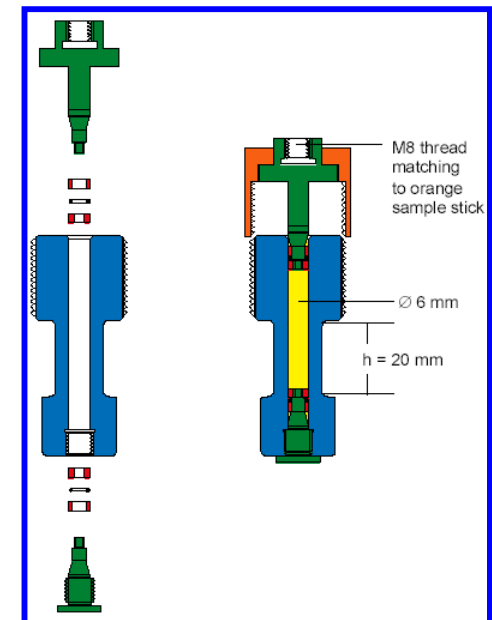
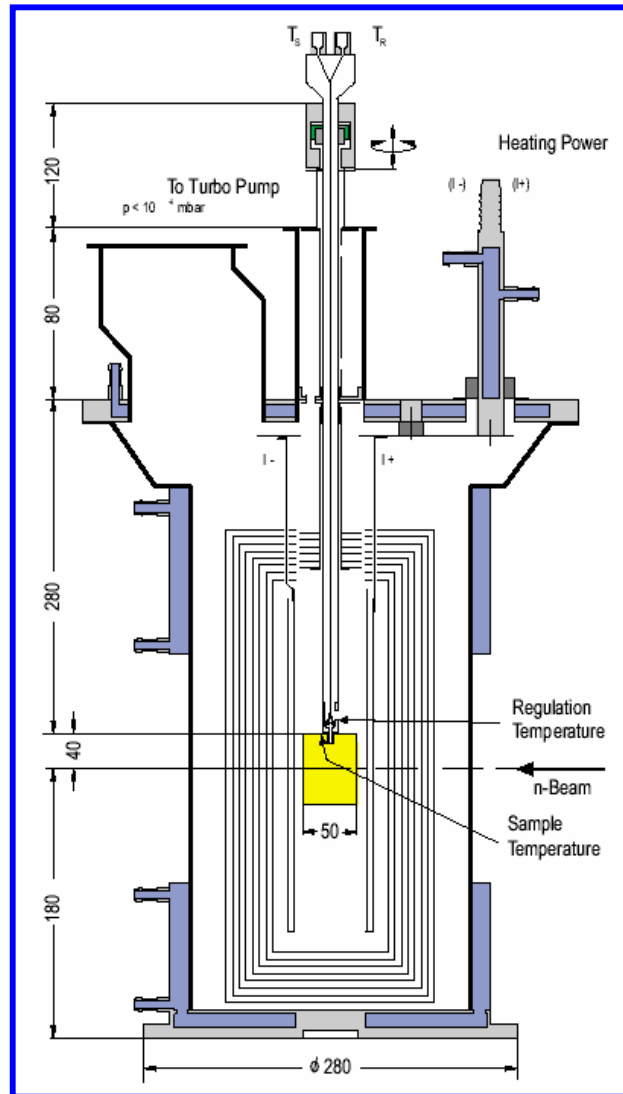


U.S.E. Handbook



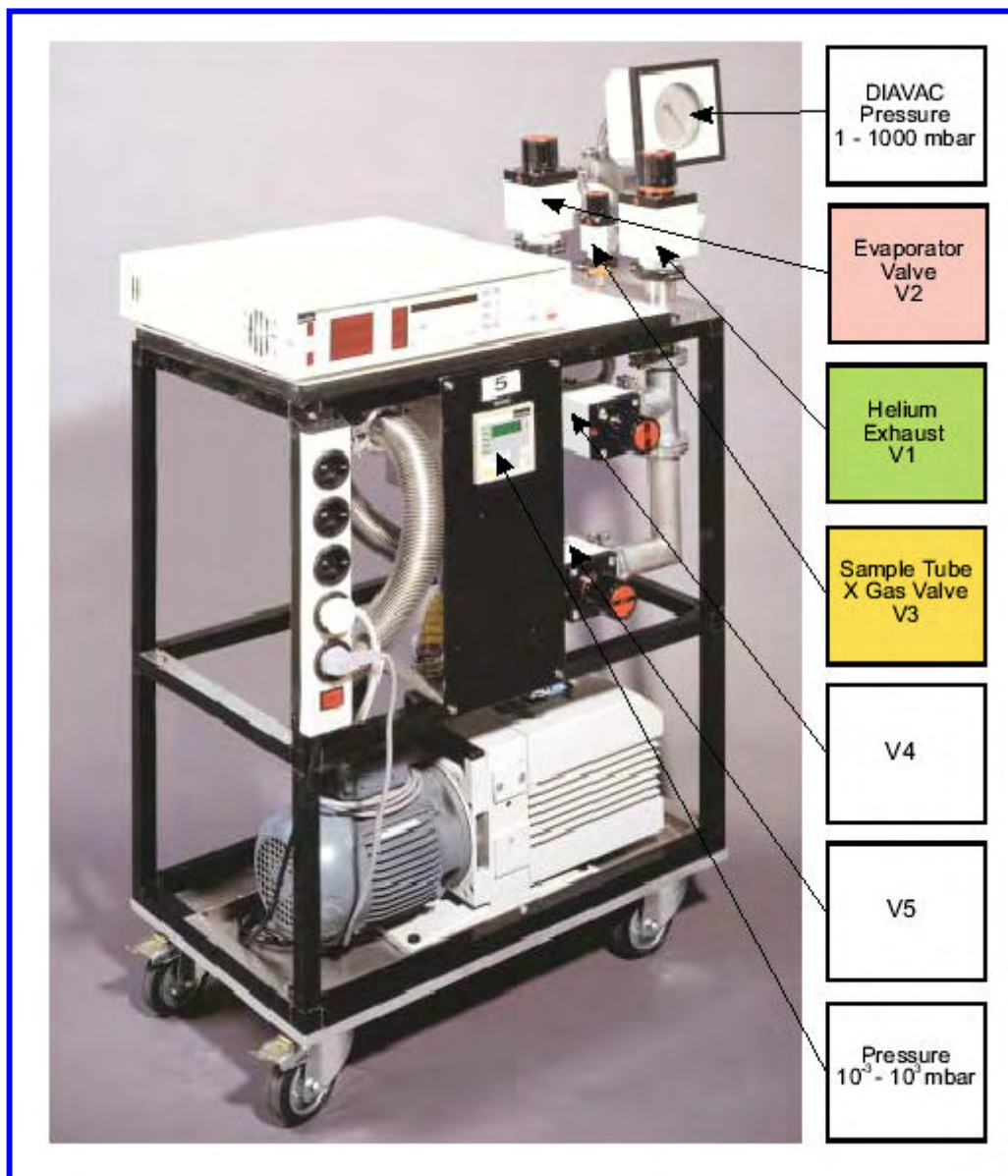
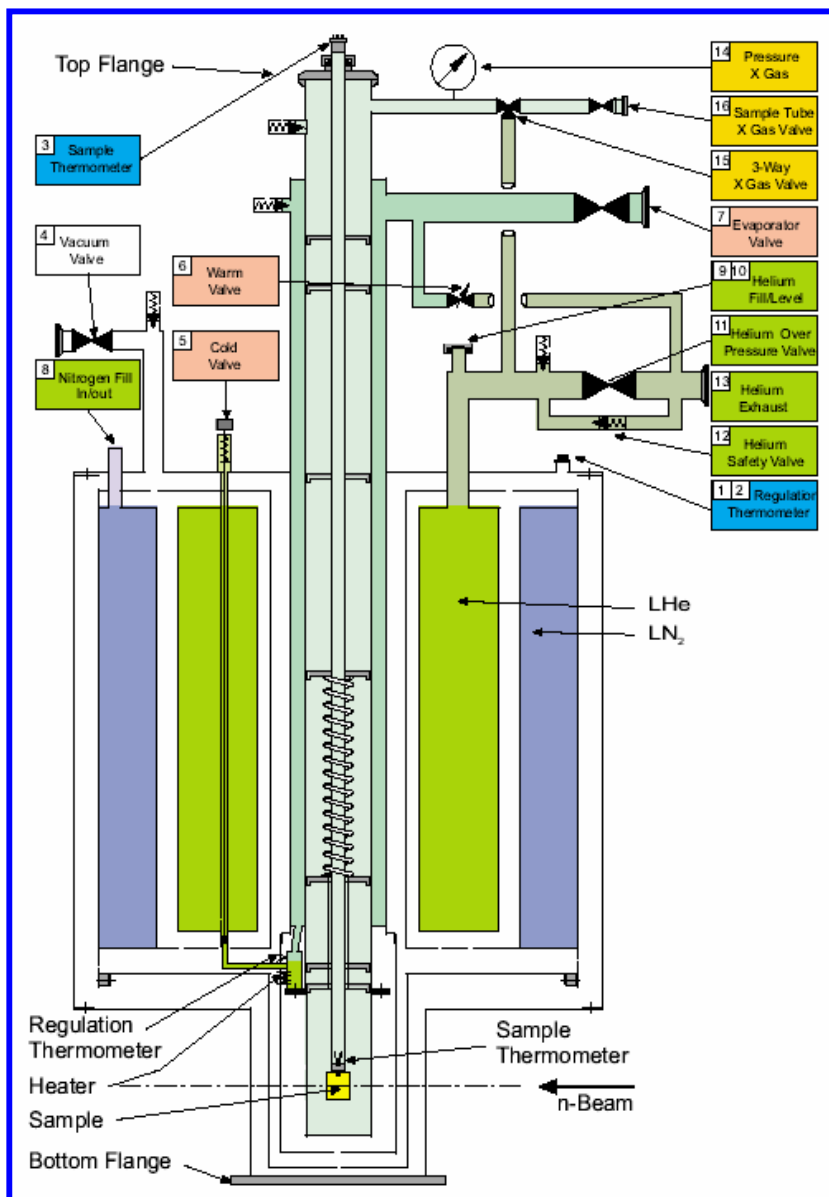
Version 2000.1

Usage of Sample Environment at BENS Technical Handbook



Planned in 2008: 3rd edition with updates on 60 items

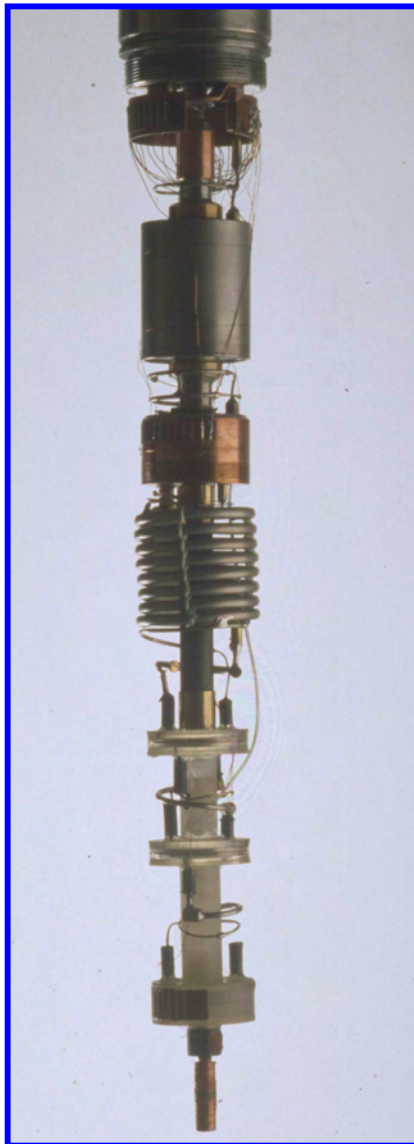
From 1995 on: The Orange Crash Course



Still in 2008: News from the Orange Cryostat → poster by S. Gerischer

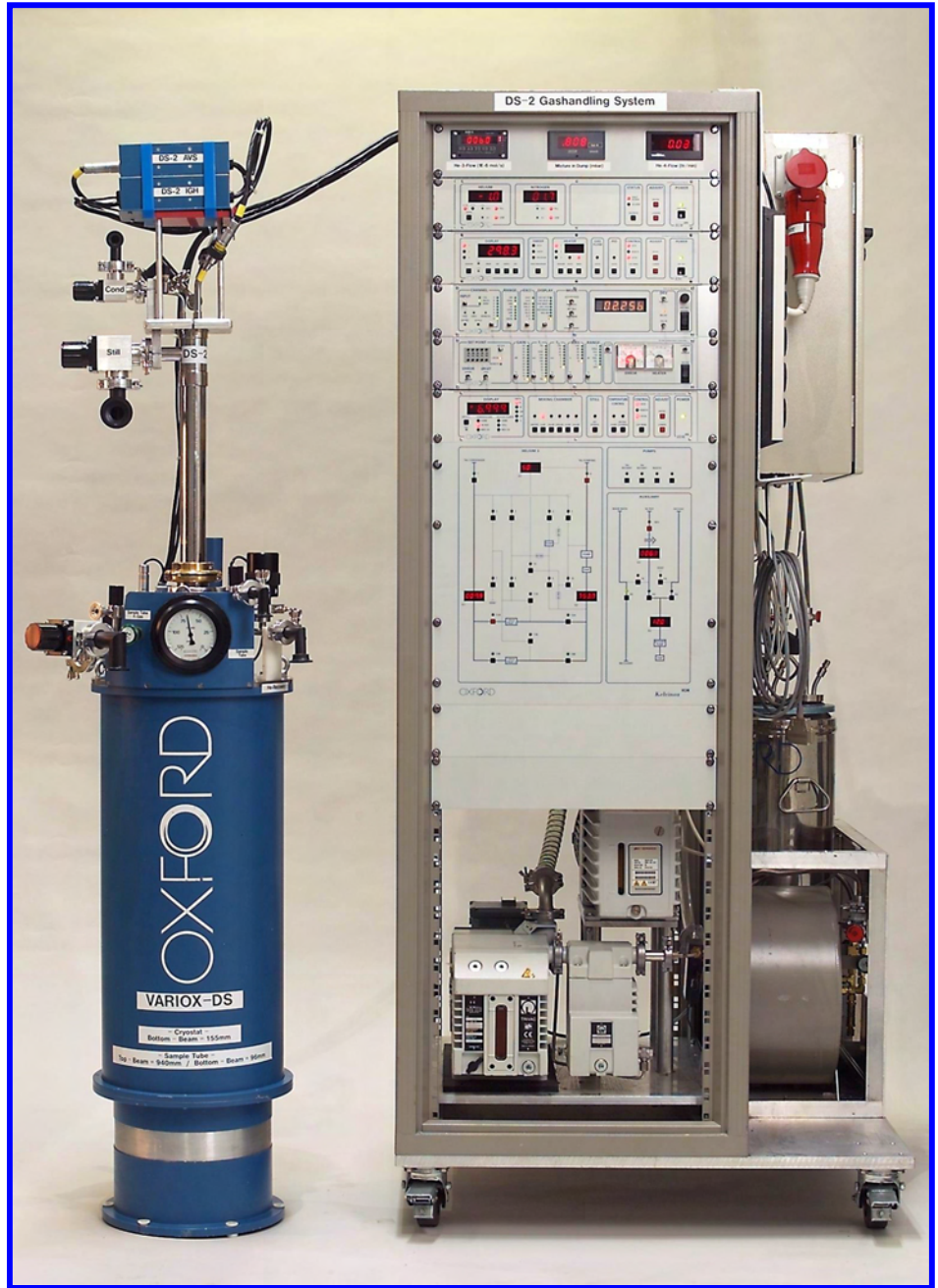
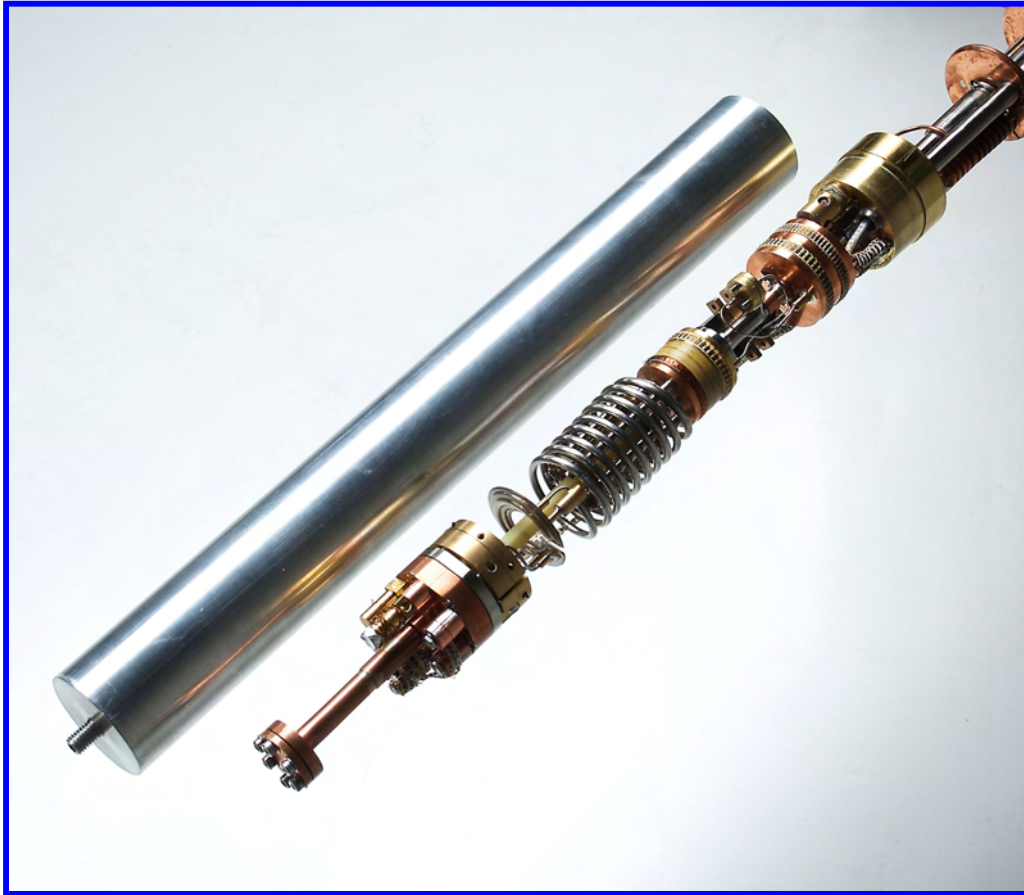
1993 - 1998: Dilution stick in Orange-X-Gas

>2000:
commercially
manufactured
by
TBT & Air Liquide



Development by Patrick Pari, CEA Saclay – at ILL: K. Neumaier & S. Pujol

**1996: OI adopts the
KELVINOX & VARIOX
to the Orange principle**



OI's dilution stick sold well – the OI-Orange not ... but, best of all: IGH !

Field

CCL: Jeremy Good, Andrew Keene

RMC: Eric Schwarz

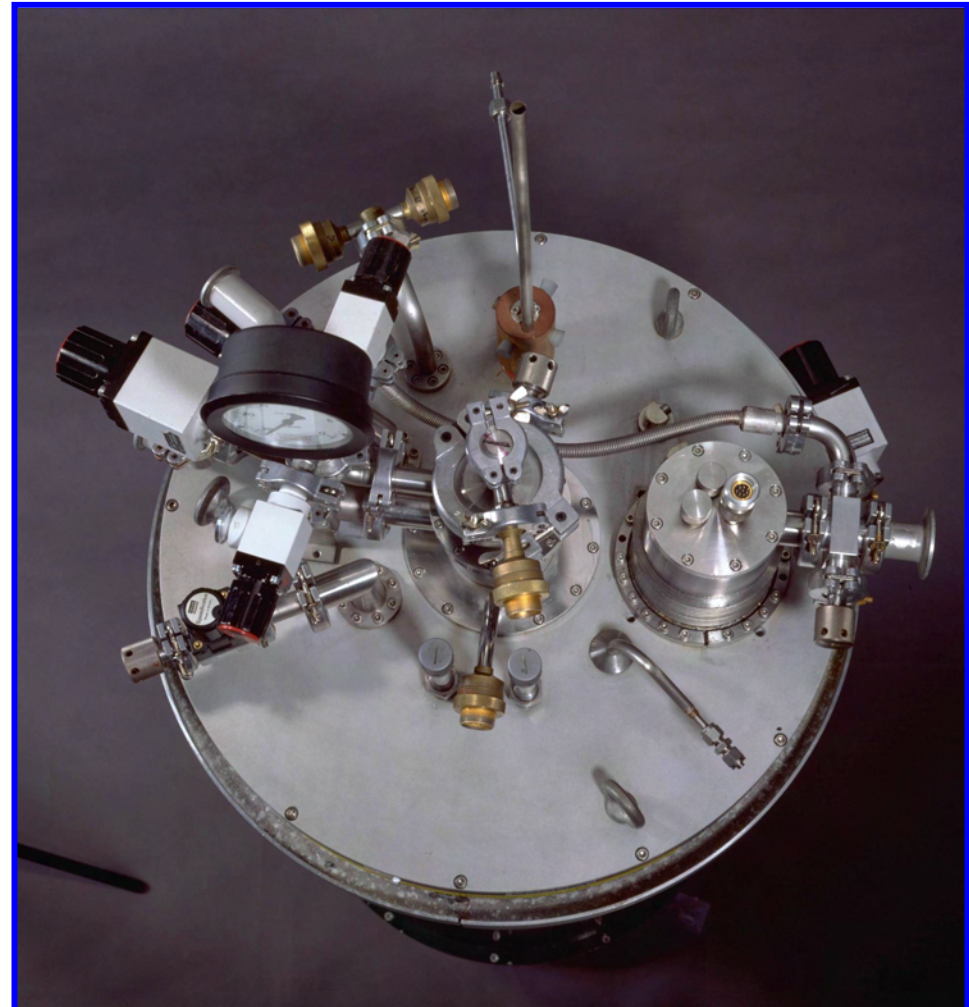
OI: Dietmar Budzylek, Peter Daniels,

Joe Brown, Elysia Ambrose,

Chris King, Gareth Griffith ...

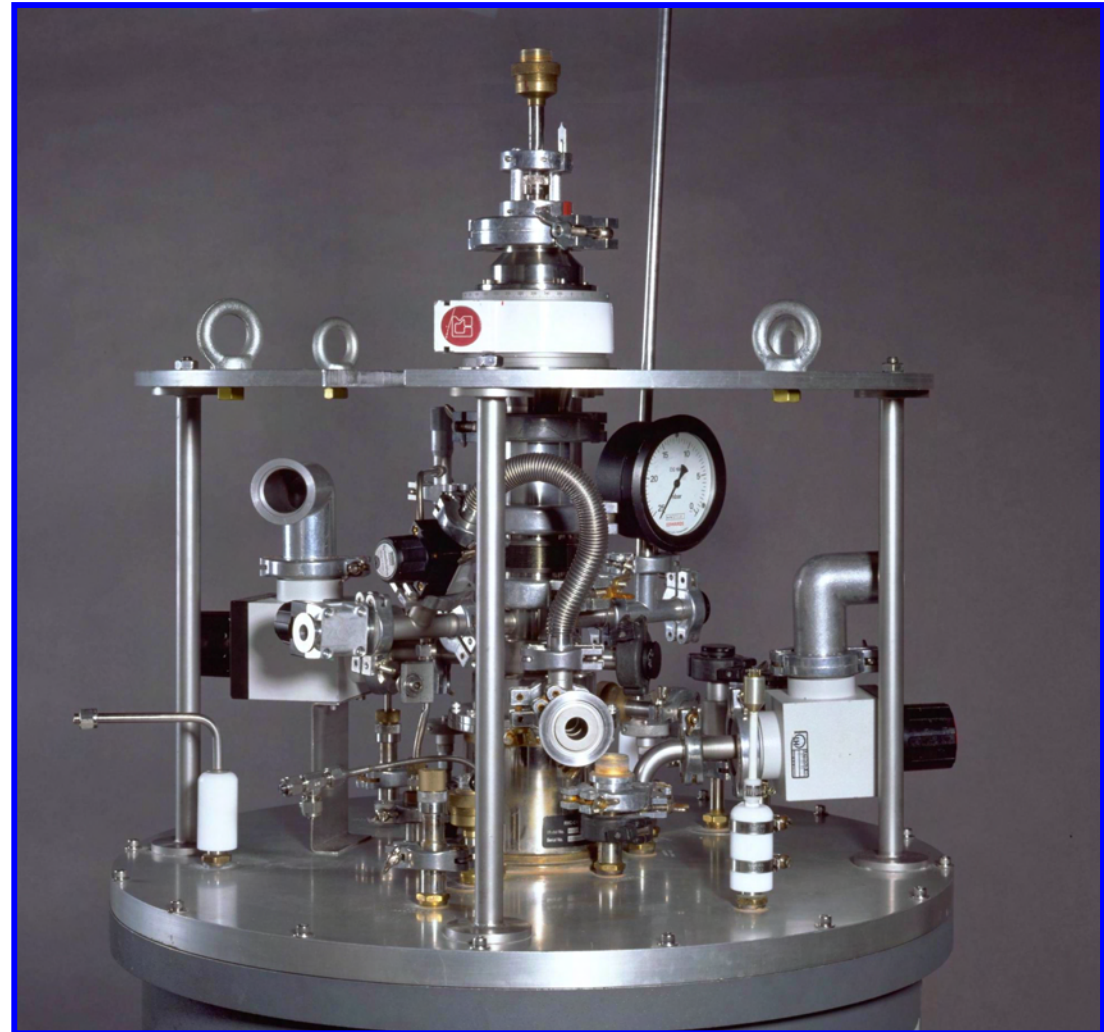
AS: the team again

**1992 – 1996: CCL's 7T
vertical split pair
→ 10 years too early**



Totally thermal conduction cooled: LN₂ pre-cool loop & LHe- λ -loop

**1995 - 2008+: RMC's 7T
horizontal split pair
→ 13+ years performance**



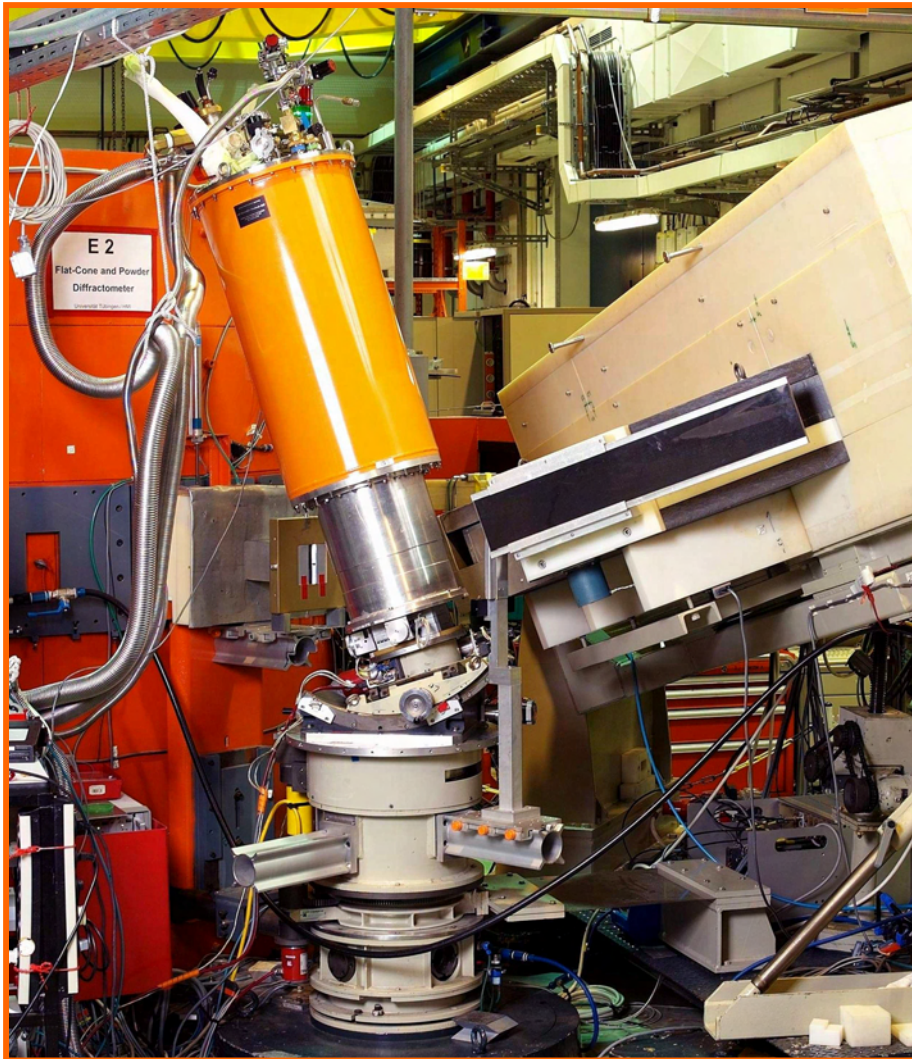
Wide angle scattering \parallel & \perp to field axis - rotating sample stick device

1996 - 2008+: AS Sci.'s 5T vertical split pair



First Orange Magnet Cryostat - with an OI magnet (the only one, ever)

1998 - 2008+: More AS Orange Magnet Cryostats



15° tilted VM-3 on the flat-cone neutron diffractometer E2



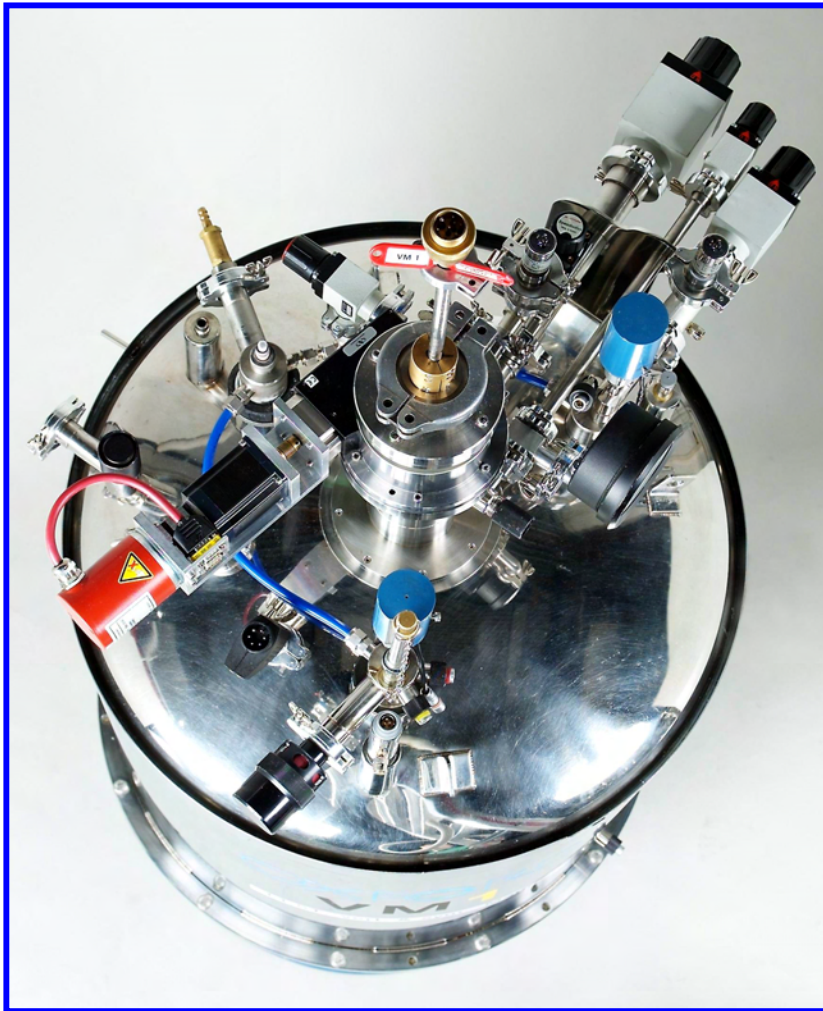
RMC 6 T horiz.
in a new
AS Jumbo body



Thor 5T vert.
in a new
AS Jumbo body

VM-5: AS 5T vert. warm bore
→ Talk given by Jörg Heinrich

1998 - 2008+: OI's 14,5 T split pair magnet cryostat



**VM-1 top view
with „Orange styling“**



**2003: Peter Smeibidl, Dietmar Budzylek
and Garreth Griffith inspecting the
„Löwenhaupt-FRM → ILL“ magnet coils**

1998 - 2008+: OI's pair of Dy-booster pole shoes



**Today, BENSC performs the highest magnetic field strength
in neutron scattering experiments
with 18 T (in VM-1B) @ $T = 1.5$ K to ~ 80 K**

Since 2006: Complementary to Neutrons ...

The Laboratory for Magnetic Measurements at BENSC

Klaus Kiefer, Bastian Klemke, Michael Meißner

8T ³He-System
Heat Capacity
Temp.: 300 mK
Field: 8T



14.5T ³He-System
Heat Capacity
Magcal. Effect
Magnetization
Temp.: 260 mK
Field: 14.5T



LaMMB

17T Dilution System
Heat Capacity
Magnetization
Temp.: 8 mK
Field: 17T
Start: 2008



5T MPMS
SQUID
Temp.: 1.8 K
Field: 5 T



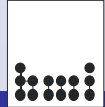
14T PPMS
Heat Capacity
Magnetization
Dielectric Meas.
Temp.: 1.8 K
Field: 14 T



	May 2008																															
Date	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Day	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
RW		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
CM-3T																																
CM-14.5T																																
CPMG-14T																																
MPMS-5T																																
CM-17T																																
Control																																

→ see poster by Klaus Kiefer

2002 → ~2010: The N40T/30T project



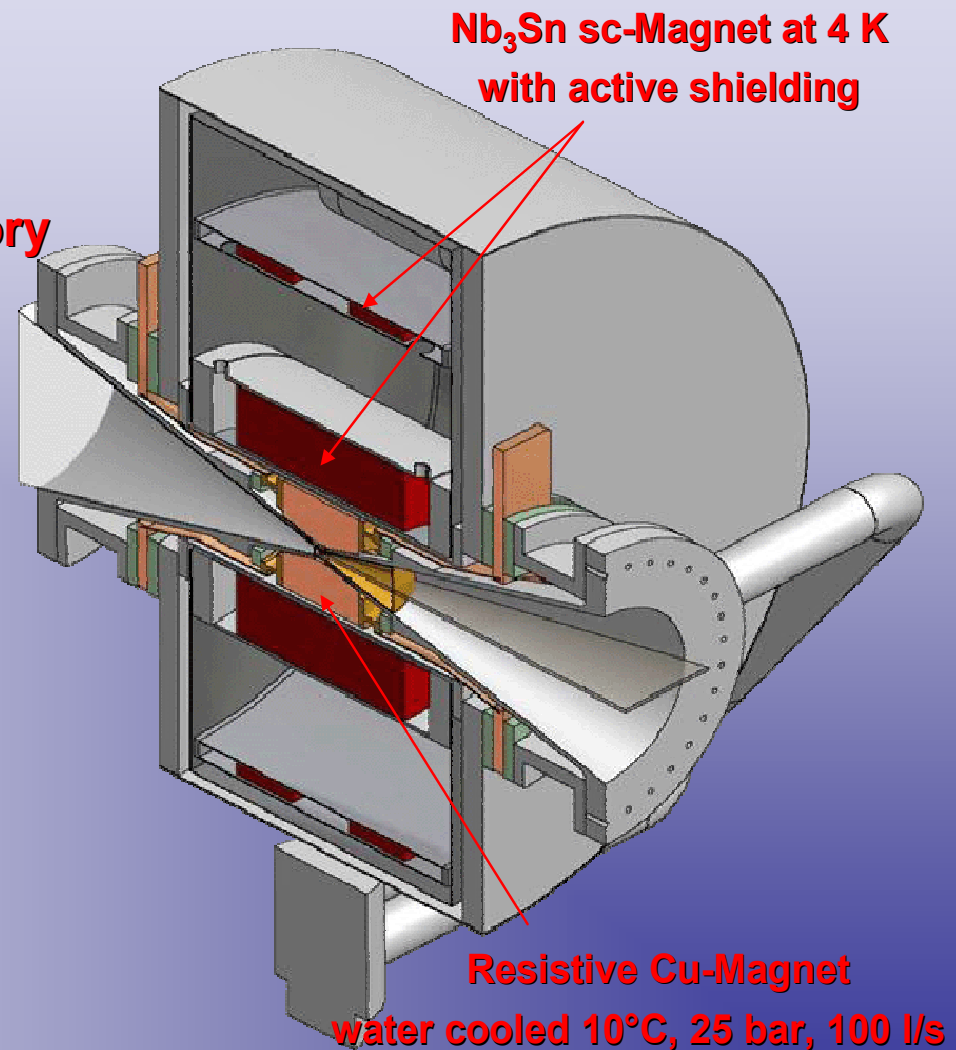
Hahn-Meitner-Institut Berlin



Serial Hybrid 30 T Magnet
designed & manufactured by
National High Magnetic Field Laboratory
Tallahassee, FL, USA
projected by Peter Smeibidl

Estimated specifications
at max. serial current 20 kA:

P_{electric}	P_{cooling}	$H_{\text{res}} + H_{\text{sc}} = H_{\text{total}}$
8 MW	3 MW	17 T + 14 T = 31 T



Pressure

ILL: Serge Pujol, Frederick Thomas

ISIS: Ian Bailey, Zoe Bowden ...

OI: Herbert Albrecht

AS: Paul Wiggins, Beth Evans

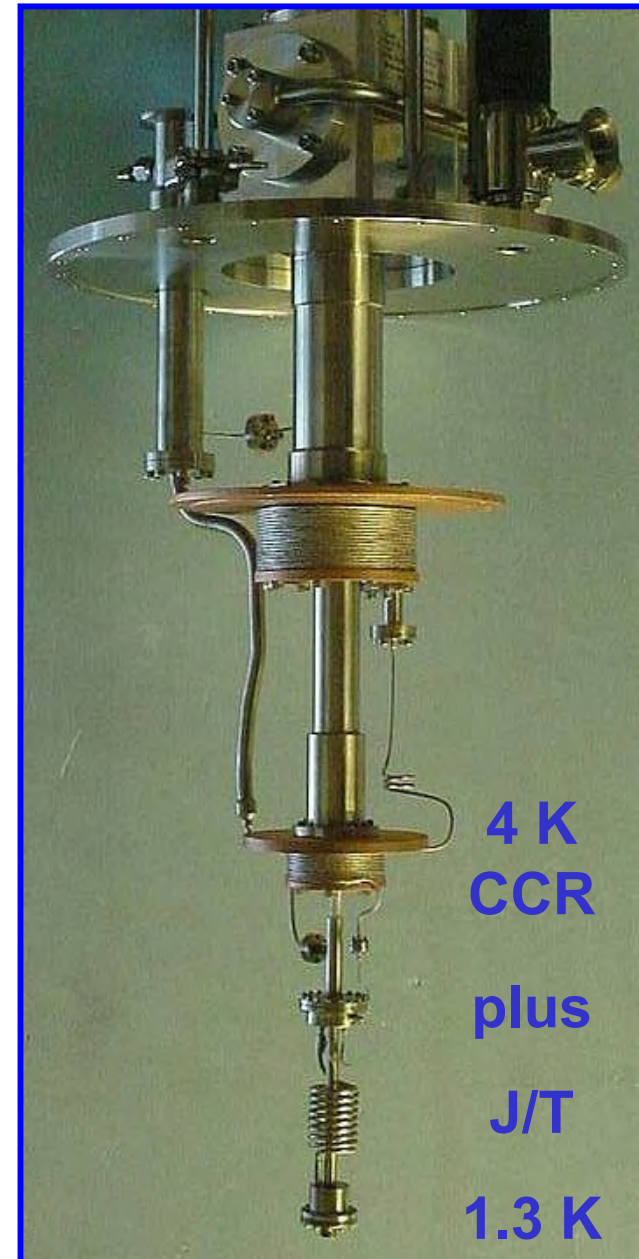
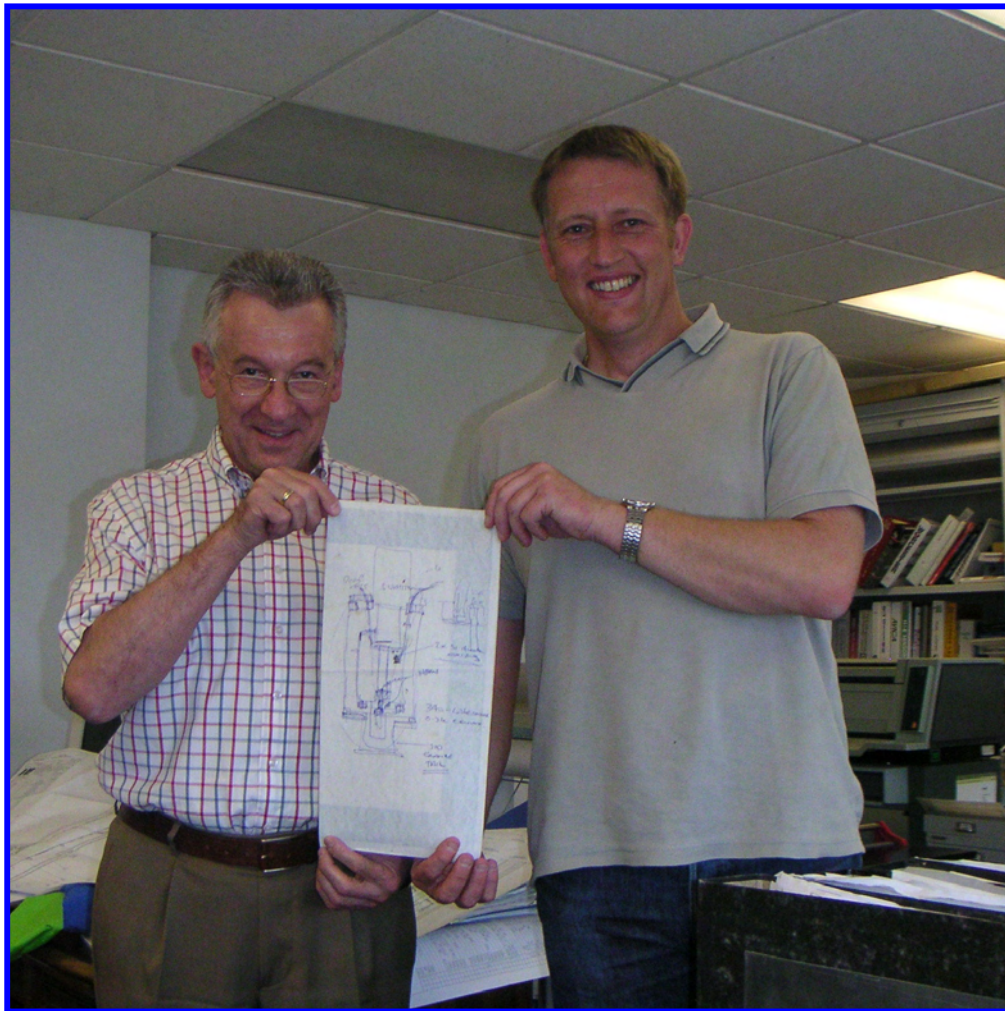
ARS: Ravi Bains

IAP: Rudolf Herrmann

TransMIT: Günter Thummes

HDT: Sigmar Mothes, Steffen Wilhelm

Since 2000: Cryogen free below 4K



June 2004: MM & PW presenting ~2002
J/T stage design on a Chinese
restaurant napkin

Since 2004: ILL design down to 1.7 K

ARS DE-202 with ^4He -J/T as 3rd stage

**for HMI's x-ray instrument for magnetic scattering MAGS
at the Berlin Synchrotron Facility BESSY**

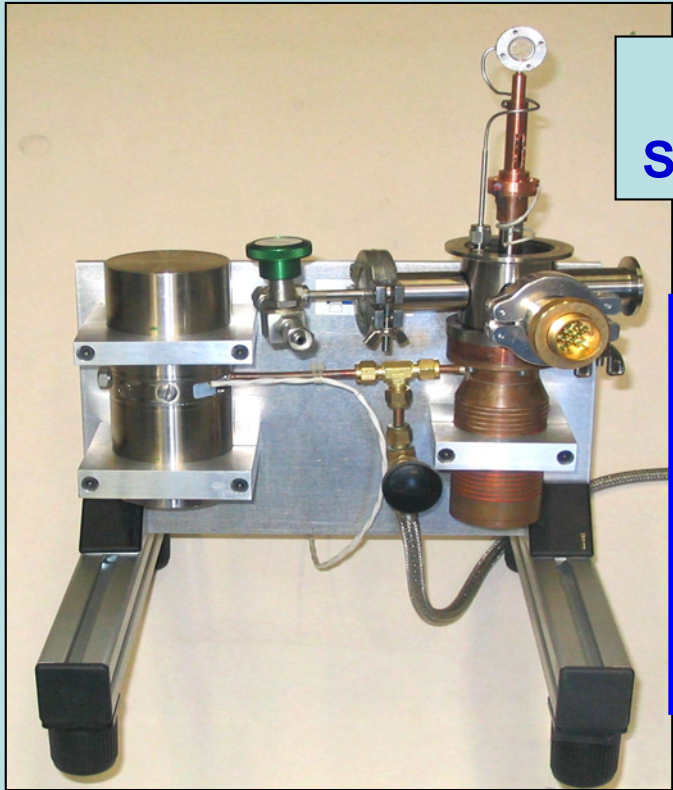


Since 2004: OI's Heliox solution (prototype at HMI)

Heliox AC-V Cryofree refrigerator

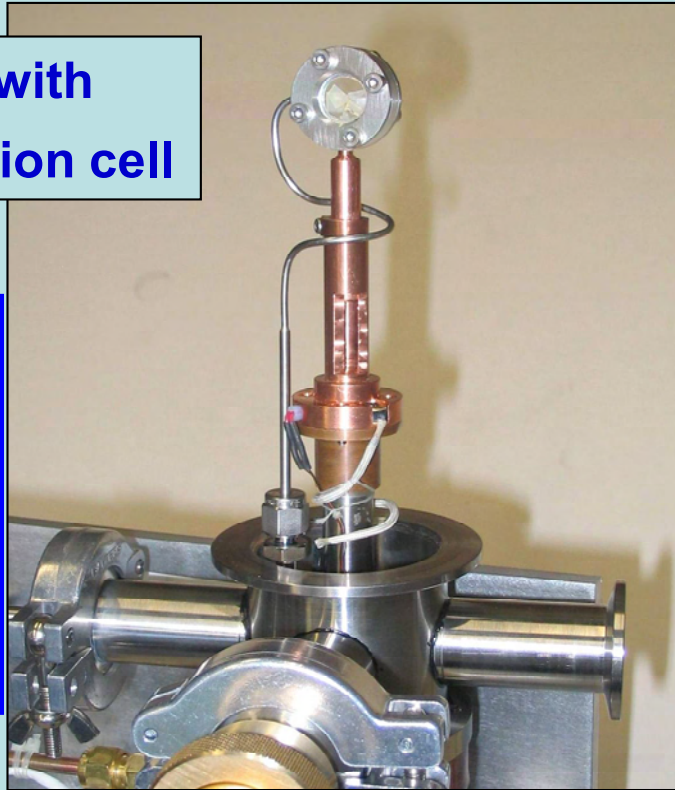
- 300mK - 300K
- +/- 0.02mK stability at base temp.
- >100 μW at 350mK cooling power.
- >50hr hold-time.
- 1 hour regeneration time.
- Sample in vacuum



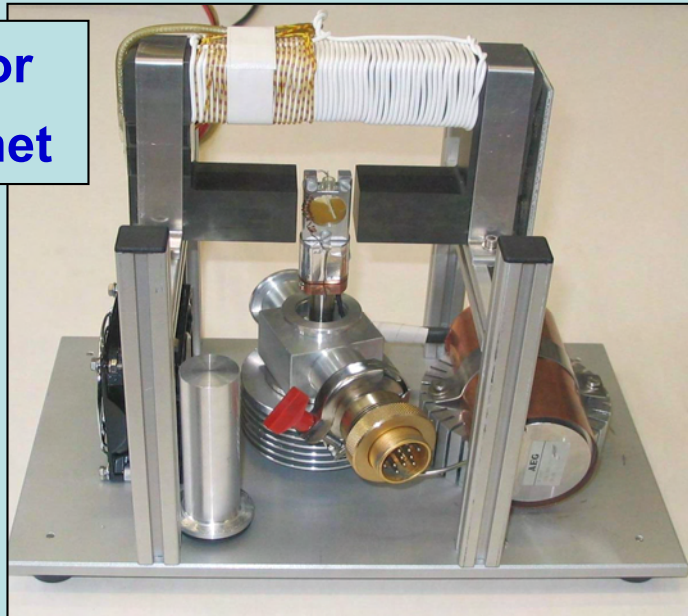


**TransMIT PTR with
SANS gas adsorption cell**

**Mini coolers
→ talk by
Günter
Thummes**



**TransMIT Stirlingmotor
SANS 10 kHz AC magnet**



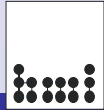
**Once upon a time in the early 90ies:
ISIS pressure manifold up to 30 bar
copied by HMI**



**Photos of
June 2004
taken at
Cosener's
House**



Since 2006: The quest for the ultimate pressure...



Hahn-Meitner-Institut Berlin



Automated Ultra-high Pressure Gas Dosing Device for 10 kbar H_2 projected by Dirk Wallacher



3000 bar Compressor
(Nova Swiss)



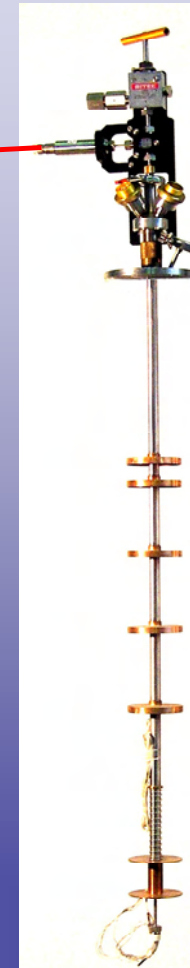
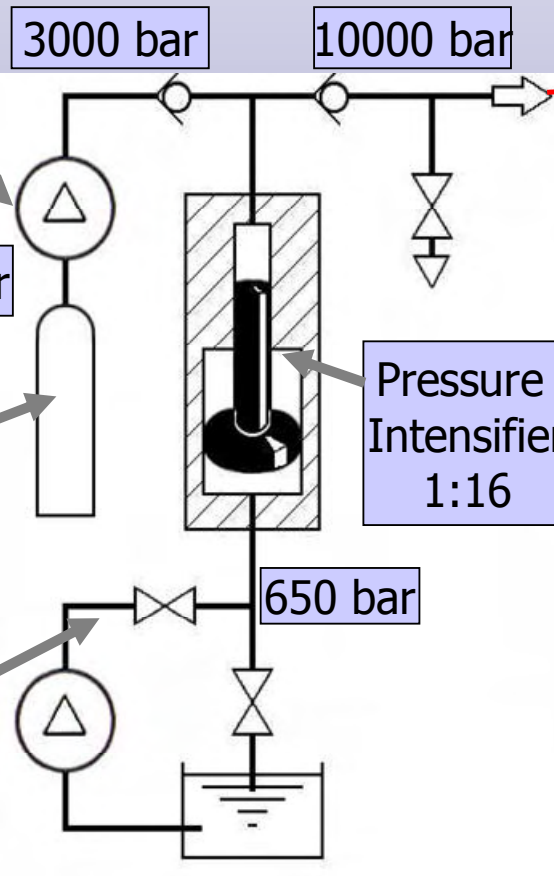
PC control
(SiMatic)

Membrane
Compressor

min. 50 bar

H_2 Gas
Supply
300 bar

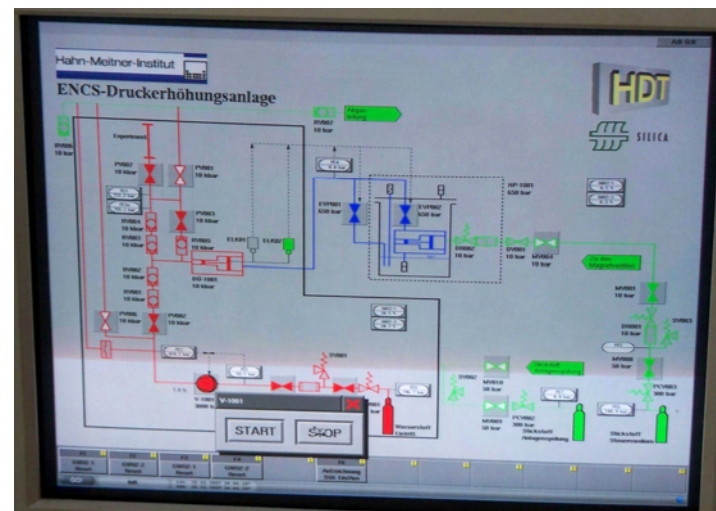
Low Pressure
Fluid



HDT

M O T H E S
Hochdrucktechnik

Dec.17, 2007: GHe @ 295 K & 10.1 kbar



... and the H₂ experiment is coming soon ...

At BENSFC specials thanks to:

Hubert Waldmann (DESY)

Peter Smeibidl (N30T)

Klaus Kiefer

Dirk Wallacher

Günter Rahn (retired)

Harald Schneider (FRM-2)

Sebastian Gerischer

Klaus-Dieter Ohlhoff (retired)

Christof Fritsche

Klaus Sperlich (retired)

Fred Liere (retired)

and many other BENSFC technical staff members

and the incredible BENSFC instrument responsables

and the so much beloved BENSFC users

and – last, but not least – the BENSFC directors

Feri Mezei, Michael Steiner and Alan Tennant