FRM II
Forschungs-Neutronenquelle
Heinz Maier-Leibnitz

JCNS
Jülich Centre for Neutron Science

Helmholtz-Zentrum
Geesthacht
Zentrum für Material- und Küstenforschung

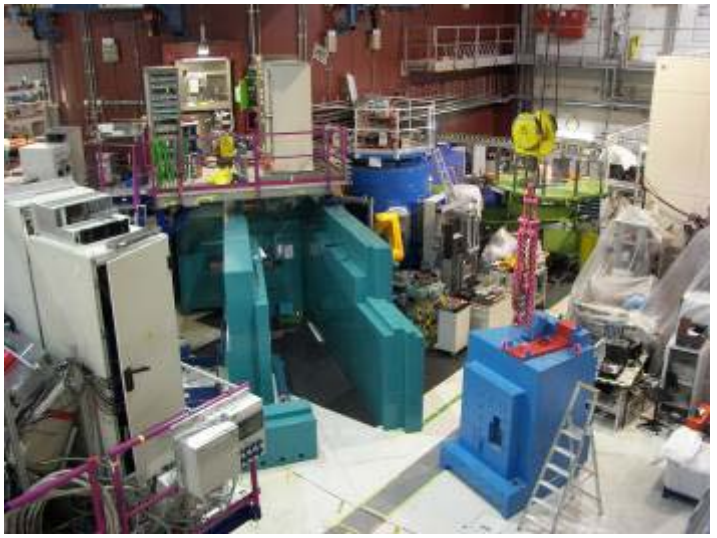
HZB Helmholtz
Zentrum Berlin

News from Garching

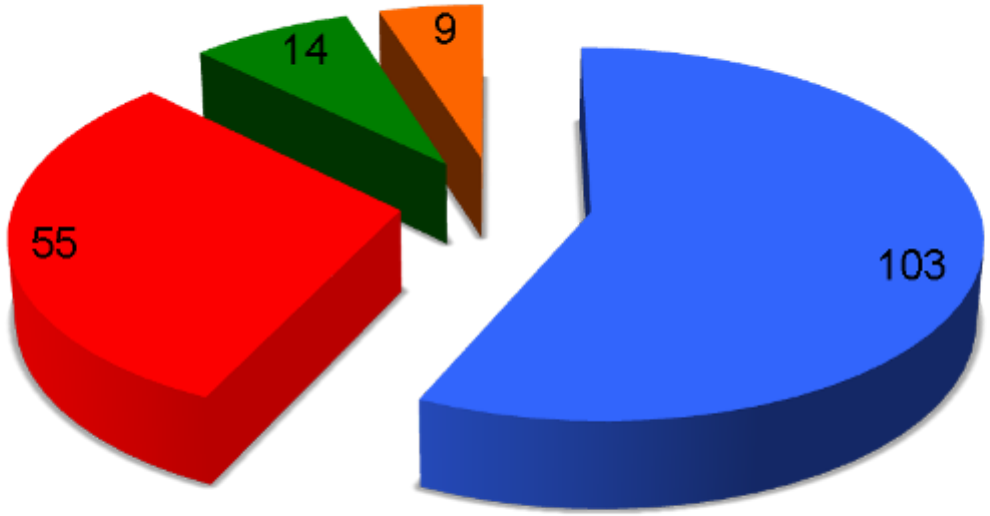
Alexander Ioffe

FRM II back to work!

- Long maintenance break 373 days, restart 2.10. 2011
- Exchange of the positron source
- New thimble for ^{99}Mo radioisotop production



Proposal Round 14

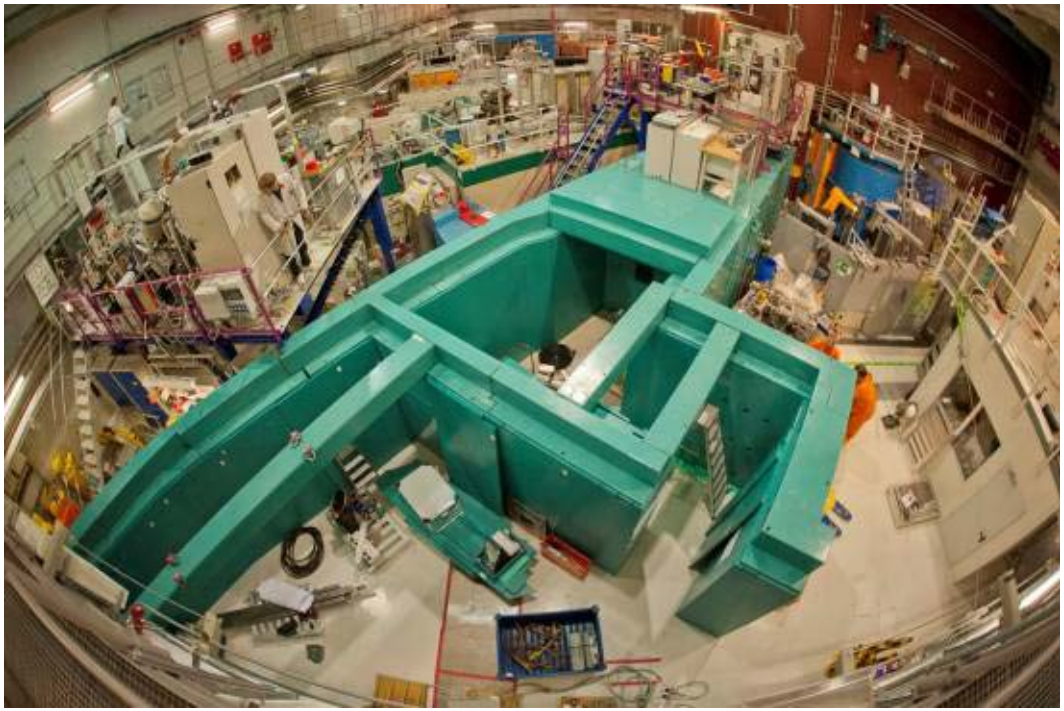


181 proposals
1498 requested days

- Germany
- Europe
- America
- Asia

ANTARES

- ✓Moved from beam tube SR4b to SR4a (free the beam port for MEPHISTO/PERC)
- ✓Complete rebuild of the instrument (exchange of >500t of shielding)
- ✓2 measuring positions, improved resolution and shielding
- ✓New options: polarised neutrons, monochromatic neutrons
- ✓**Restart second half of 2012**

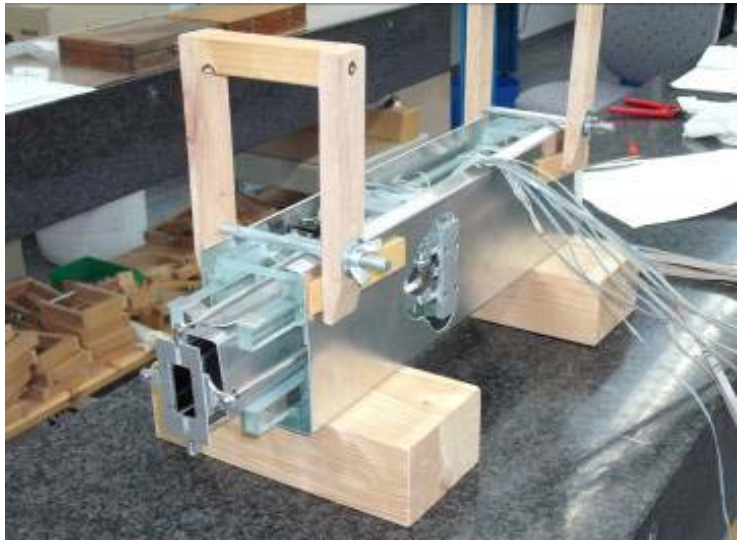


TOFTOF

Adaptive Optics Focusing neutron guide
- Small samples (5-10 mm diameter)
- Lower background from sample environment

Increasing of detectors
- from 605 to 1006 detectors
- active area enhanced from 7.26 m^2 up to 12 m^2

New electrical grounding concept
- improving the signal-to-noise ratio
- reducing external disturbance



FUTURE PERSPECTIVES

- Magnetic field for low temperatures ~3.5T)
- Inelastic neutron scattering under high pressure (6-7 kbar)

N-REX reflectometer

Upgrades

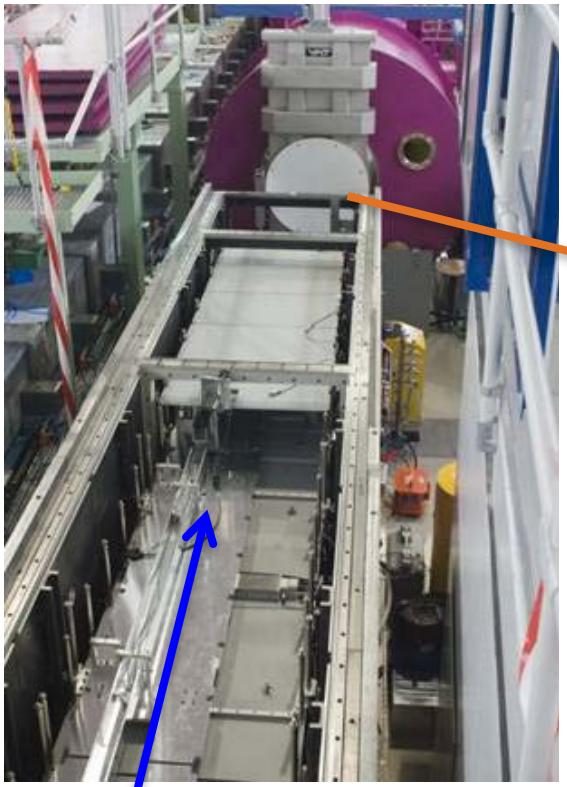
- New focusing monochromator *(gain factor = 3)*
- X-ray setup (see photo)
- New polarizer/analyzer *(Efficiency = 99%)*

Further developments

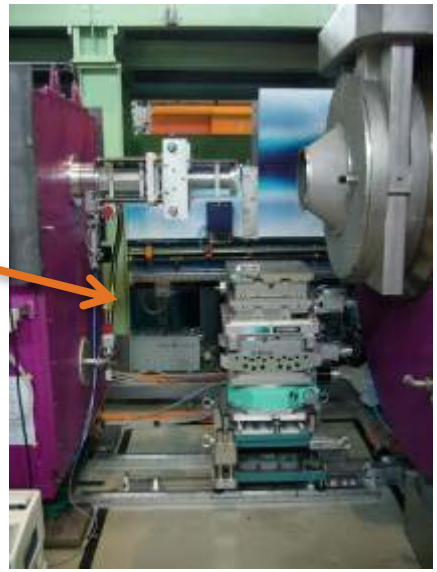
- Further increase of signal/noise ratio (focusing guide, improved background)
- Wide-angle polarization analyzer
- Advanced cells for solid/liquid interfaces

SANS-1 (TUM + HZG)

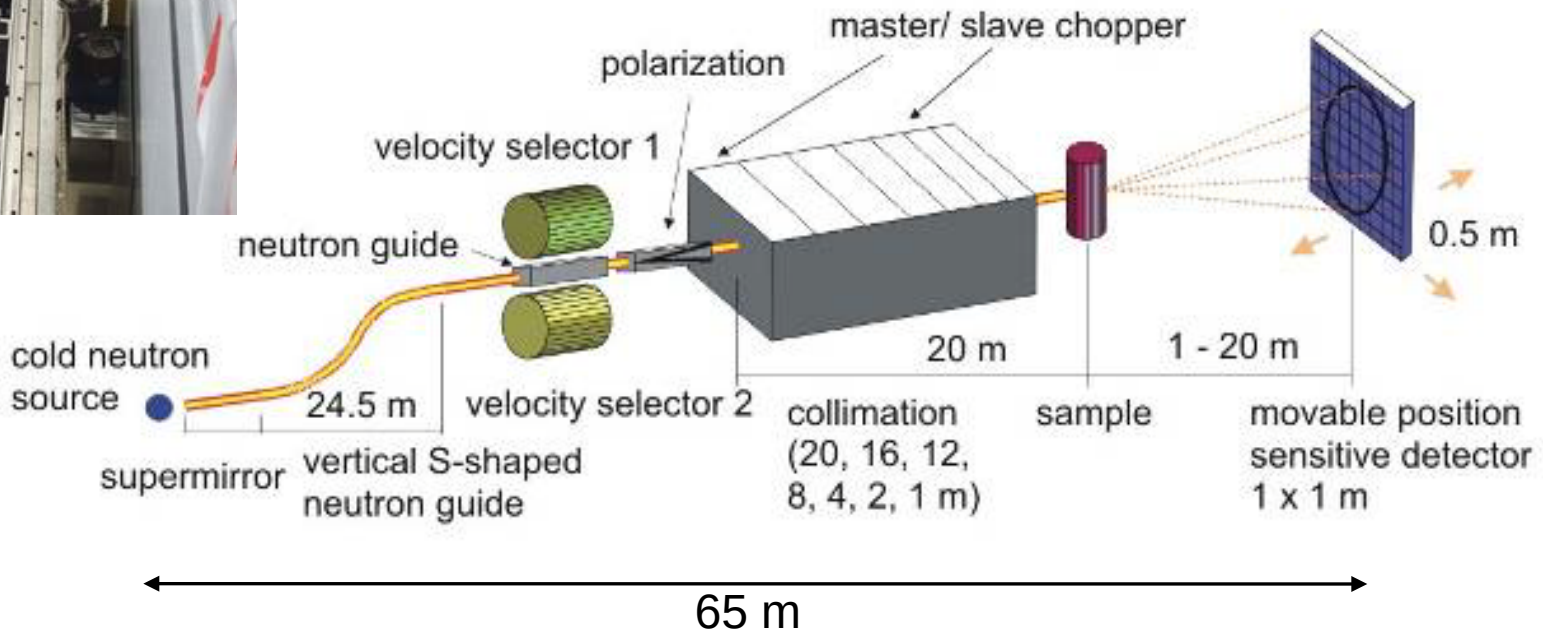
Commissioning in 2012 !



Neutrons



Scattering angle
0°–10° (2theta)



MIRA

New option: 3-axis

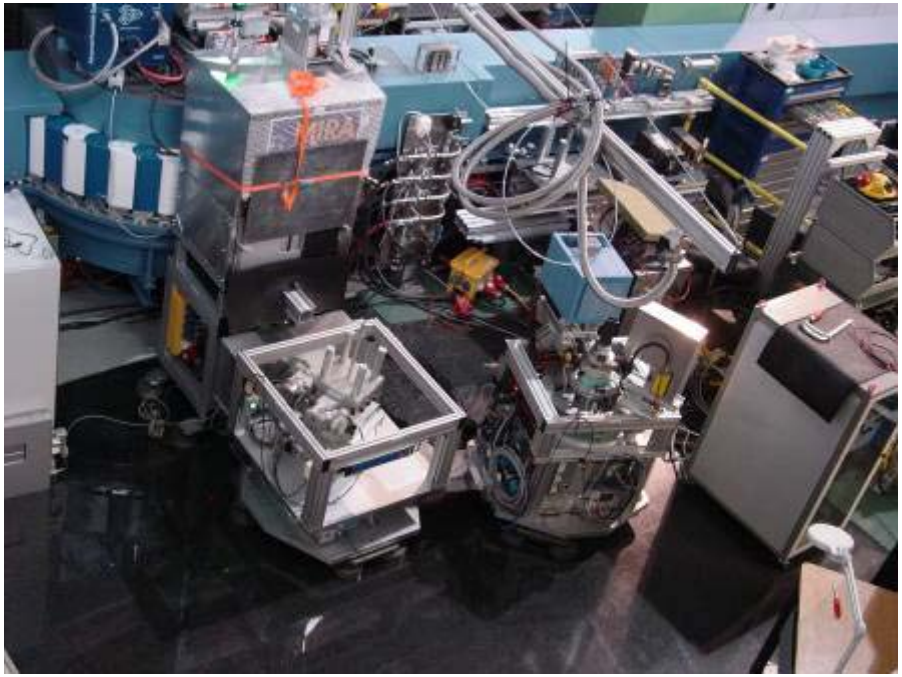
- constant k_i
- cold neutrons: 4 – 6 Å

New PSD CASCADE detector:

- 20x20 cm^2 with 128x128 Pixel
- Single event counting with a large dynamic range up to 10^8 n/s

New S-bender polariser

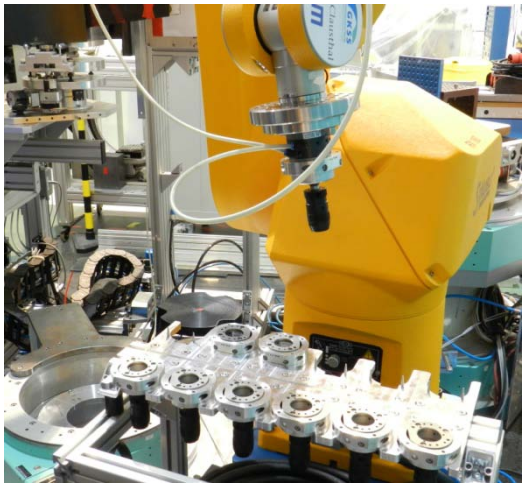
P=98.5% on 60x80 mm^2

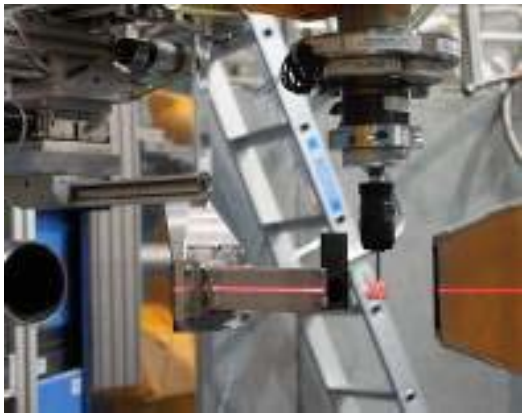


New instrument control software (NICOS)

STRESS-SPEC

Instrumental development (texture)





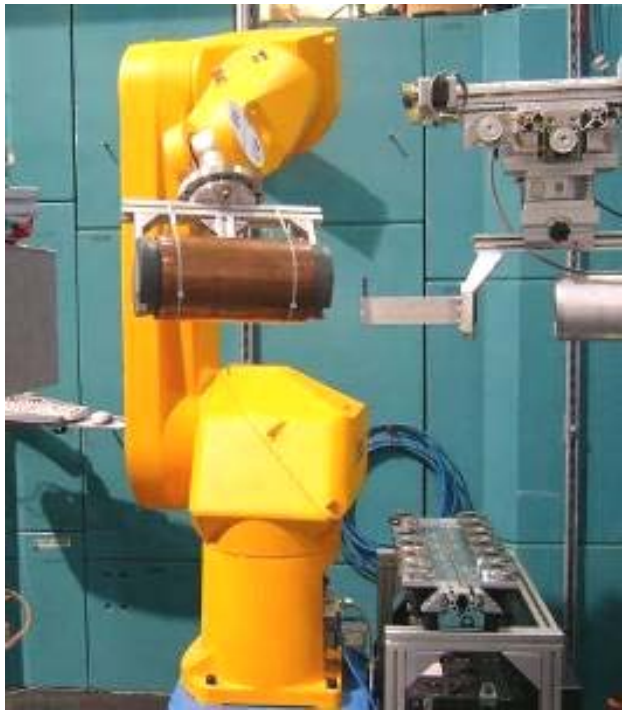
Robot and sample changer with 12 positions

TU Clausthal

ROBOT

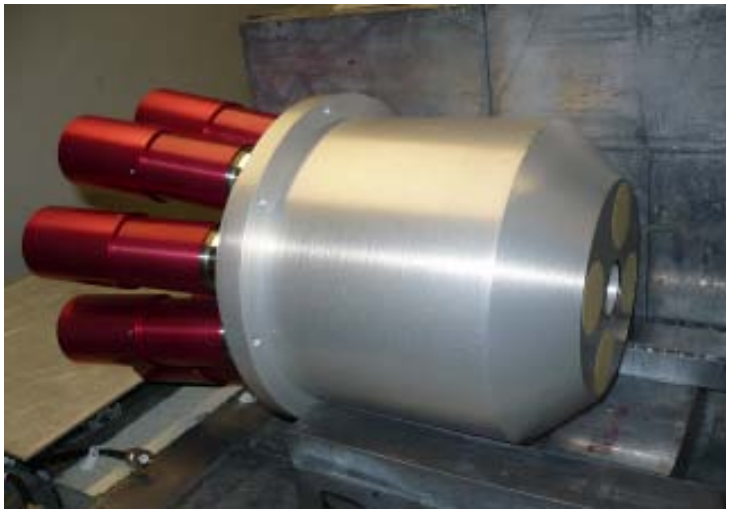
✓now standard for bulk material texture analysis

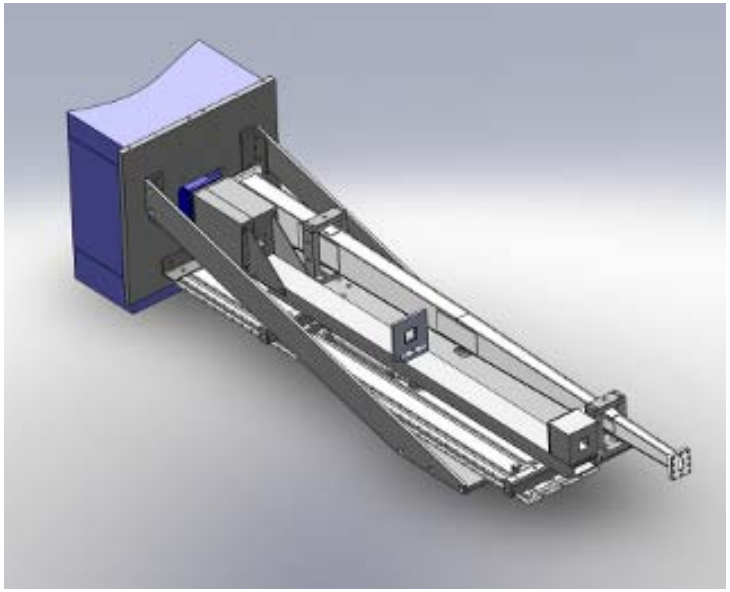
✓ great improvement in the effecient use of beam time



Robot as sample positioner for bulky samples (texture analysis)

PGAA





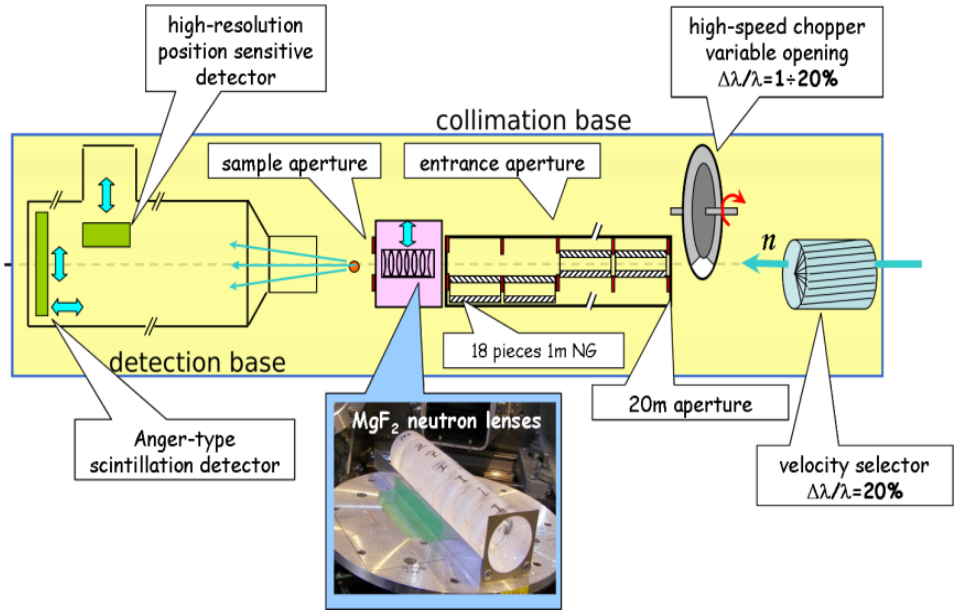
Upgrades

- Highest flux: $4x10^{10}$ cm^{-2} s^{-1} at $(2x2)mm^2$
  Earlier background: ~7000cps
  New background: ~400 cps

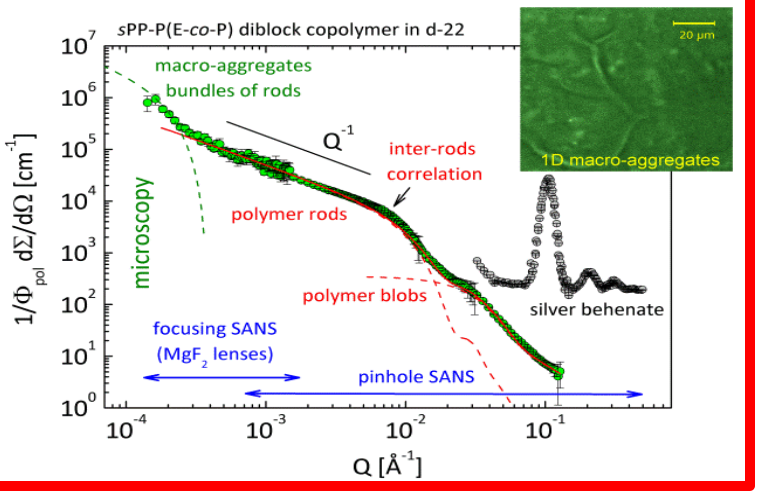
- Working flux: $2x10^{9}$ cm^{-2} s^{-1} at $(10x10mm^2$
  Earlier background: ~200 cps
  New background: ~11 cps

Best in the world signal/background ratio for PGAA instruments.

KWS-2 – Wide Q-Range/High Intensity SANS -Diffractometer



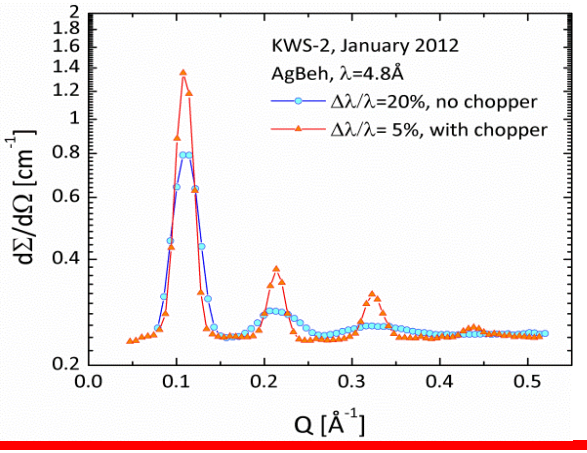
Q-range in pinhole mode $7 \cdot 10^{-4}$-0.5Å^{-1}
with MgF_2 lenses: $Q_{min} \rightarrow 2 \cdot 10^{-4}$Å^{-1}



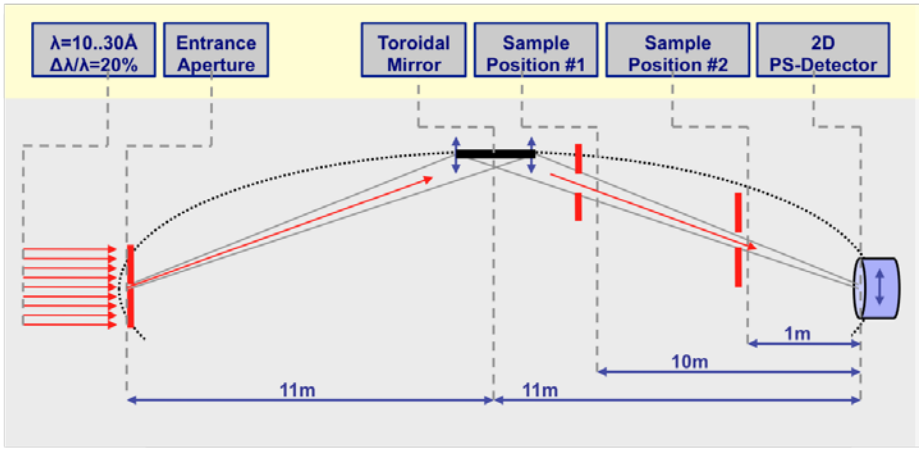
- Was initially built in a short 8m version, now finally in the full 20m version
- Maximal flux: $2 \cdot 10^8$ n/cm^2/s (similar to D11&D22)

Status: user operation in full version

Chopper: tunned Δλ/λ resolution



KWS3 – Very High Resolution Focusing SANS Diffractometer



Important improvements:

Improved Q-resolution:

→ $Q_{min} = 4x10^{-5}Å^{-1}$

Extended Q-range:

→ $(4 \cdot 10^{-5} \ldots 3 \cdot 10^{-2})\ Å^{-1}$

(2nd sample chamber at 1.2m)

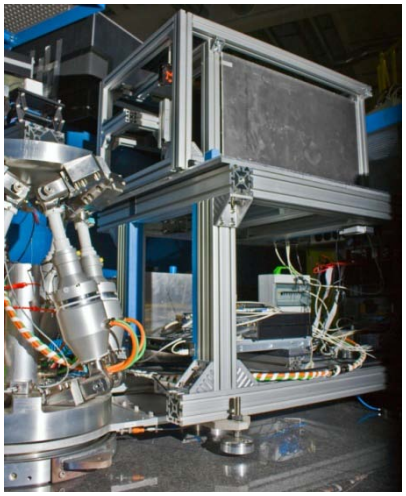
Boosted flux (20x more than in Jülich) :

$Q_{min}=4 \cdot 10^{-5}Å^{-1}$ -1000 n/s; $Q_{min}=1 \cdot 10^{-4}Å^{-1}$ - 11000 n/s; $Q_{min}=2.5 \cdot 10^{-4}Å^{-1}$ - 70000 n/s

(another 3x after the repair of the neutron guide)

Status: user operation

MARIA – Magnetic Reflectometer



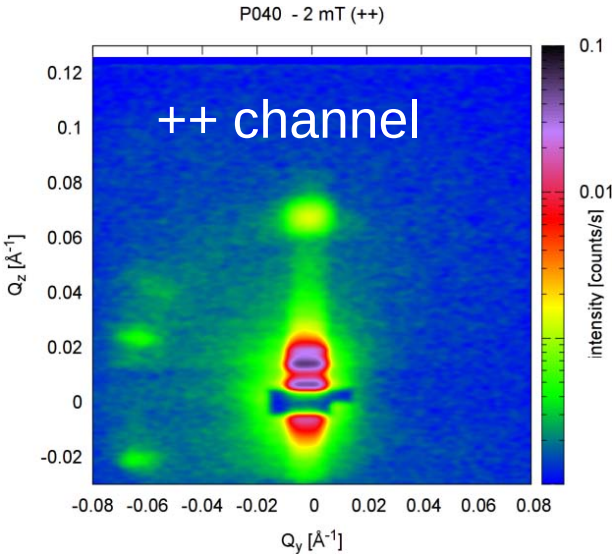
Hexapod with a sample and on-beam ^{3}He-SEOP analyser (constant ^{3}He polarization)

Vertical reflectometer for specular, off-specular and GISANS measurements:

- Typical sample size 10 x 10mm²
- Thin layers down to sub mono layers
- Full polarisation analysis as standard

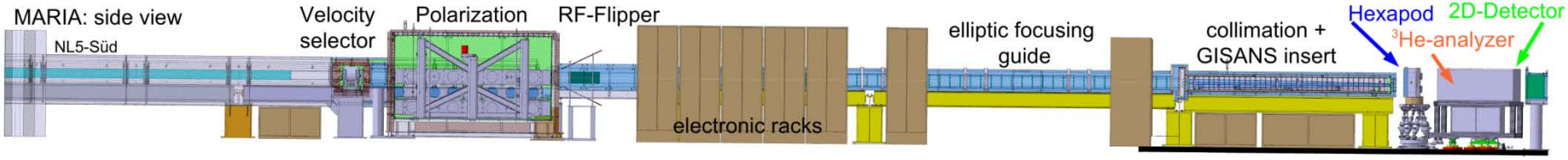
(∅32cm detector coverage, analyzed neutron polarization 90%)

- Lateral structures from nm to µm range

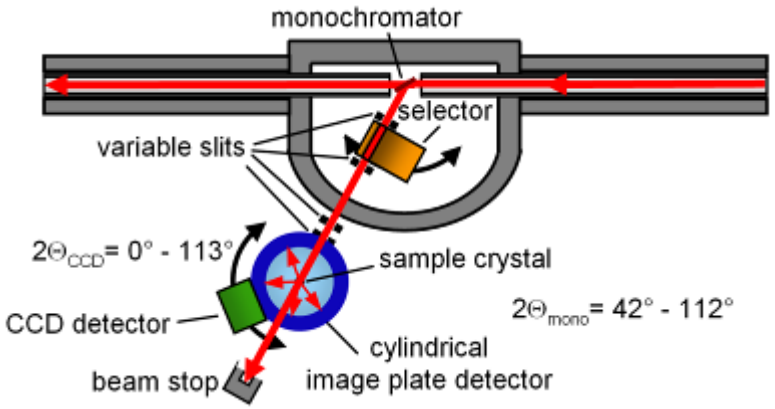


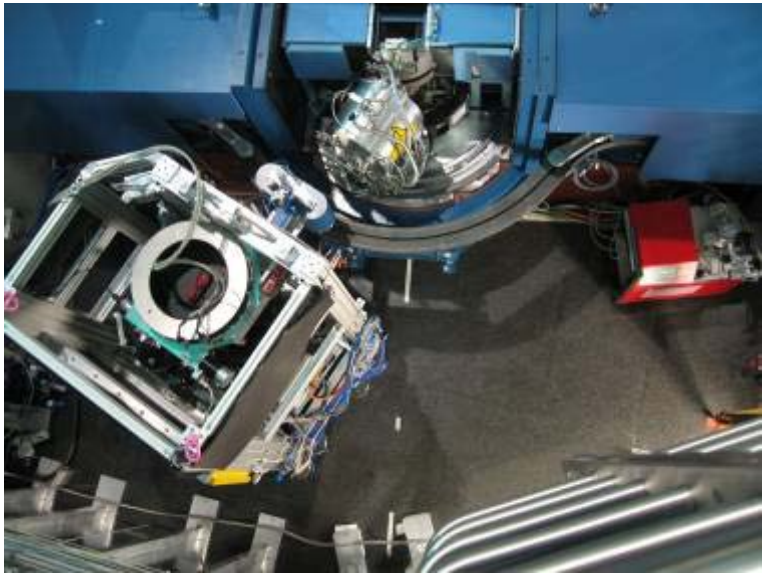
Fully polarised GISANS measurements of Fe_2O_3 nanoparticles at T=10K and B=0.75T

Status: in user operation



BioDiff – Diffractometer for Crystals with Large Unit Cells





Monochromator	PG002, mosaicity: 0.4 – 0.5° wavelength range with selector: 2.4 - 5.6 Å wavelength range without selector: 2.4 - 6.1 Å
Higher order filter	velocity selector, transmission: 87% for 2.4 Å
Collimation	adjustable slits down to 1 mm
Wavelength resolution for 2.4 Å	$\Delta\lambda/\lambda$ = 2.9%
Divergence (no slits) for 2.4 Å	horizontal: 0.8° FWHM vertical: 0.7° FWHM
Main detector	neutron image plate (cylindrical), radius=20 cm; angular range: ±152° horizontal; ±48° vertical pixel size: 125, 250, 500 µm^2
Auxiliary detector	CCD camera with scintillator: 200 x 200 mm distance to sample: 100mm CCD: 2048 x 2048 pixel; pixel size: 13.5 µm^2 spatial resolution: 300 µm^2
Sample environment	Oxford Cryosystems Cryostream 700 plus: 90 – 500 K (will be available soon...)

Status: starting user operation...

BioDiff – first test with both detectors

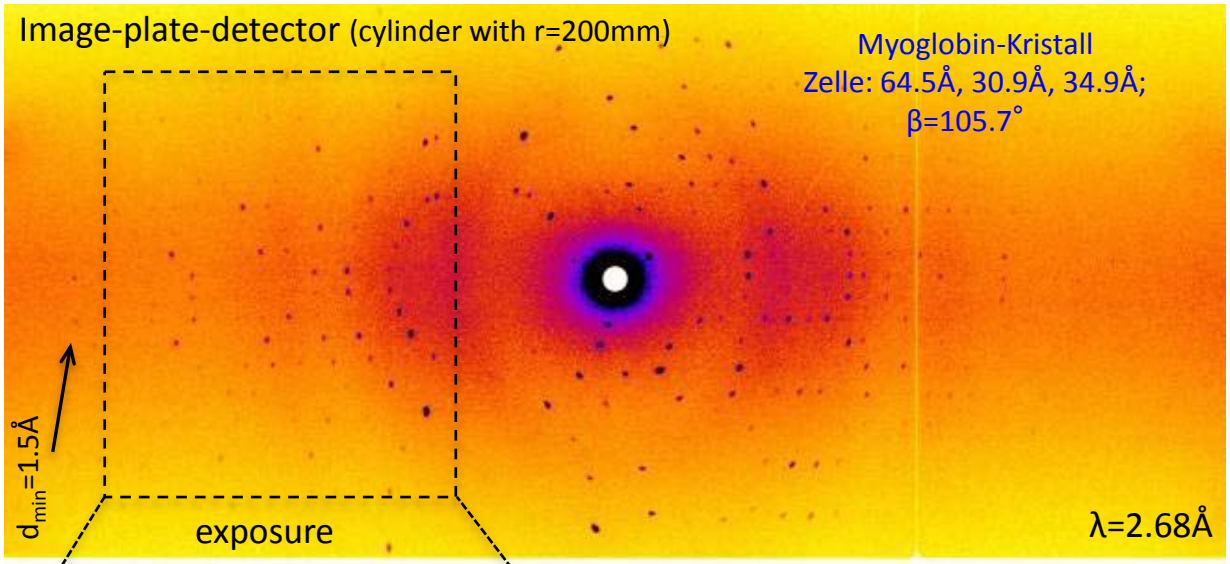
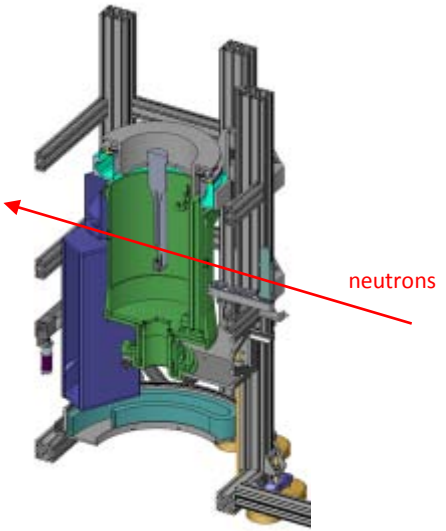
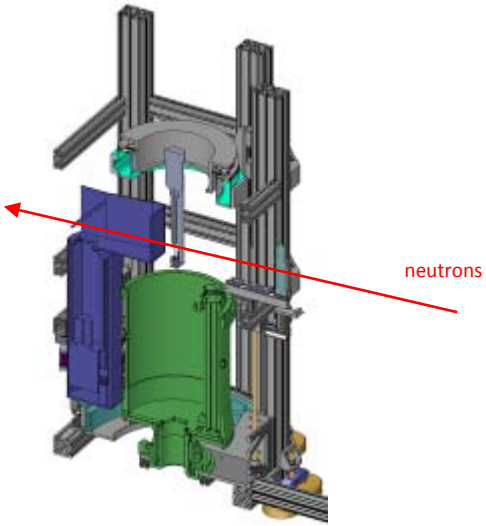


Image-plate-detector active:



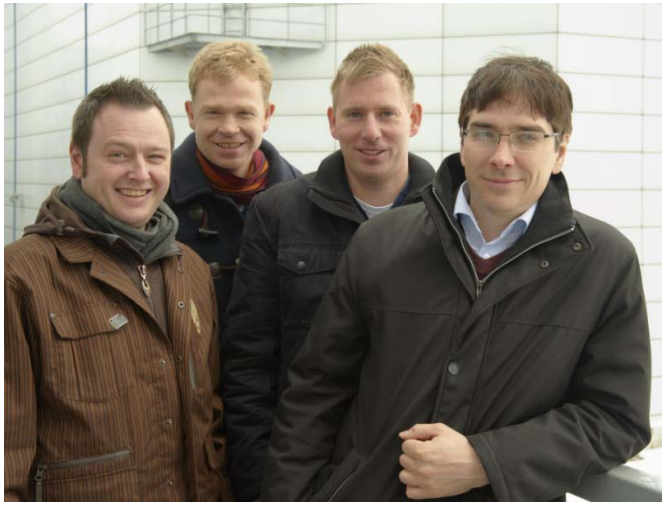
- Gd_2O_3 / ($BaFBr:Eu^{2+}$)
- covered solid angle: ±155°
- scanner resolution: ≥ 125 µm
- readout time + erasing: ≈ 5min

CCD-camera active:



- ^{6}LiF/ZnS scintillator
- 2Θ- angle: 0-113°
- overall resolution: ≈ 300 µm
- readout: ≥1sec

Scientific Computing Group



- a joint group of JCNS and TUM
  - created in 2011
  - staff of 4 since January 2012
  - one more JCNS position open
  - TUM positions will follow later

- serving all scattering instruments at FRM II
- - development of data analysis software
- - definition of data formats
- - scientific collaboration on prototypical experiments

- first project defined by German High-Data-Rate Initiative (HDRI)
- - collaboration with DESY, HZG, HZB
- - analysis software for SANS/SAXS
- - physical modelling for GISANS/GISAXS

Incident on the neutron guide NL5 in the Neutron Guide Hall West

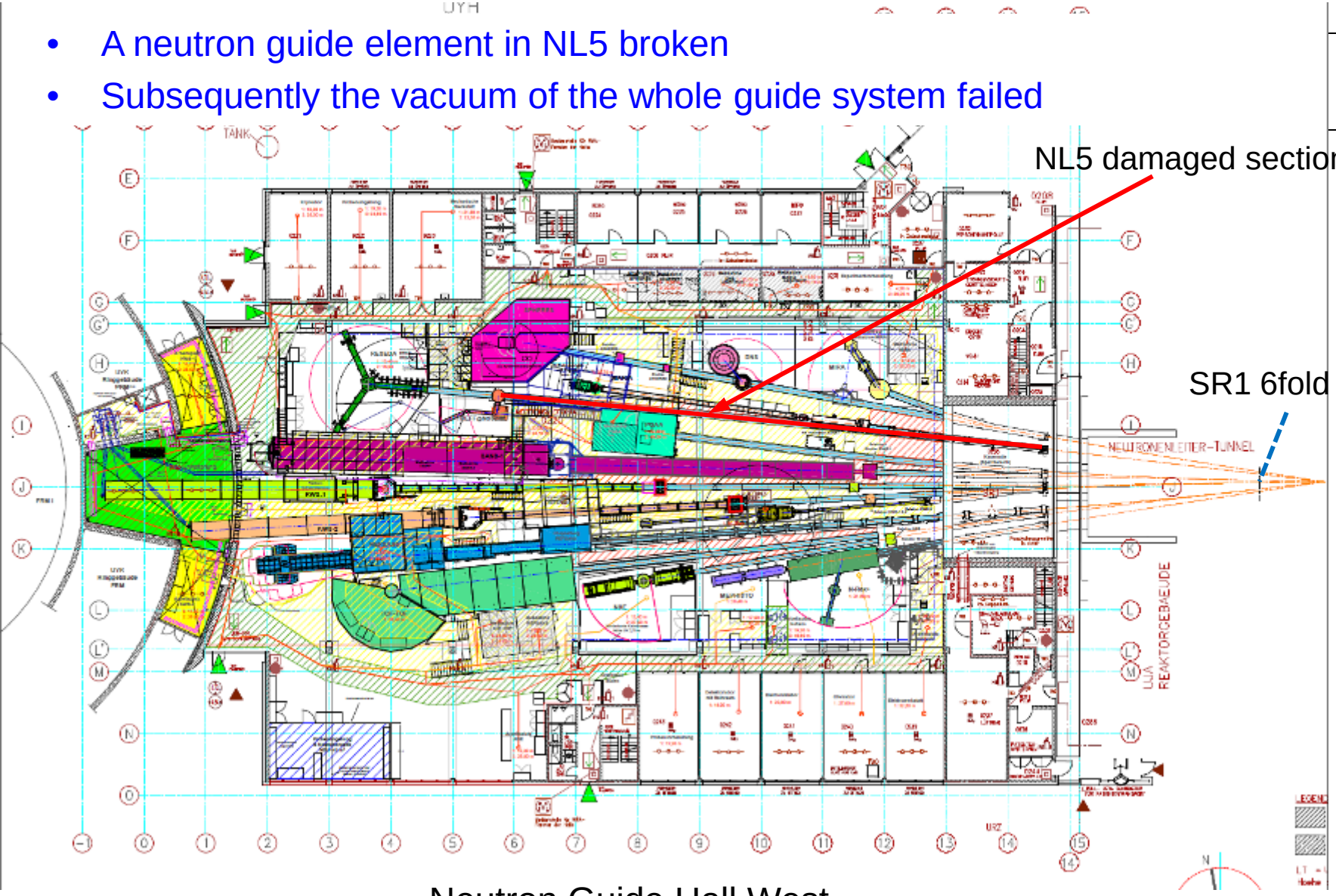
- A neutron guide element in NL5 broken
- Subsequently the vacuum of the whole guide system failed

<u>Two steps of repair:</u>

- replacement of Al window at the main shutter during next reactor shutdown

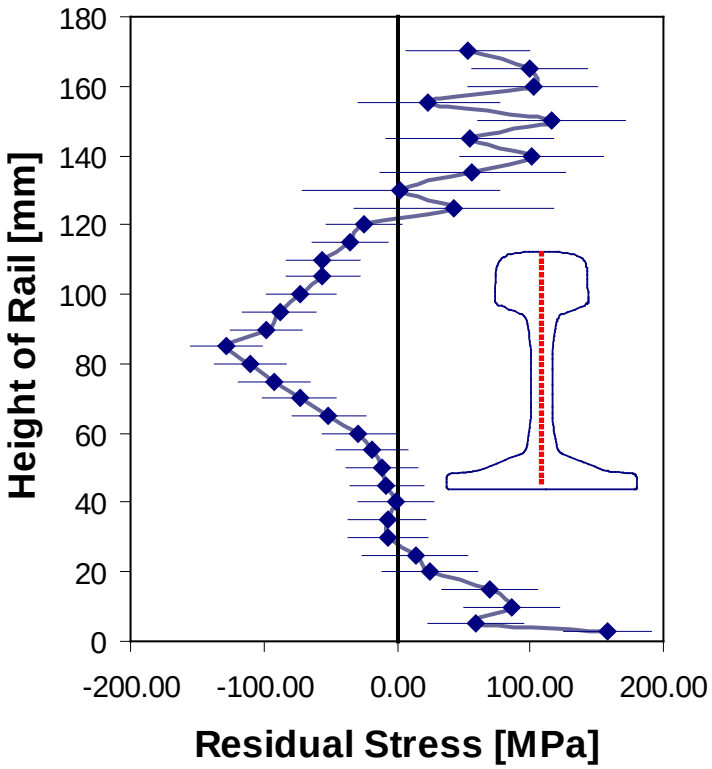
  → neutrons back except NL5 (MARIA, TREFF, RESEDA) since the next cycle (April 2012)
- the repair of NL5 after inspection, replacement of damaged guide elements

- A neutron guide element in NL5 broken
- Subsequently the vacuum of the whole guide system failed



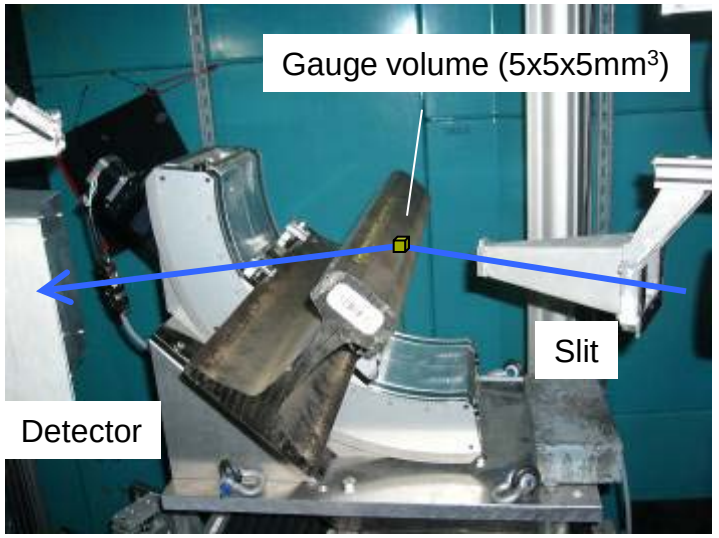
Neutron Guide Hall West

STRESS-SPEC – Residual Stress



J. Keckez *et al*, Uni Leoben, Austria

Experiment (No. 5771, Feb. 2012)
Aim: Influence of straightening on residual stress profile in rails



- First time! Longitudinal stress profile through a complete rail
- **Maximum path length through steel ~ 70 mm**