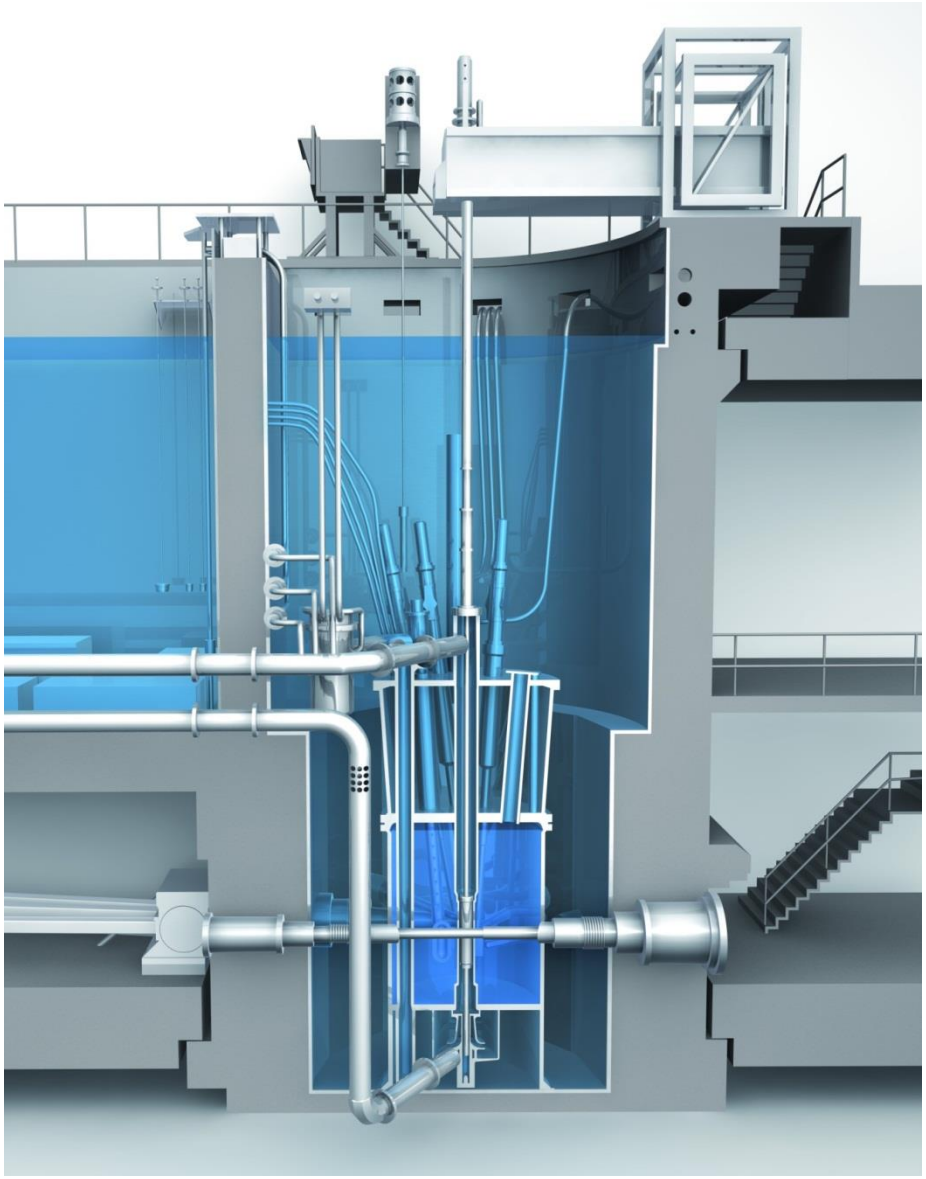
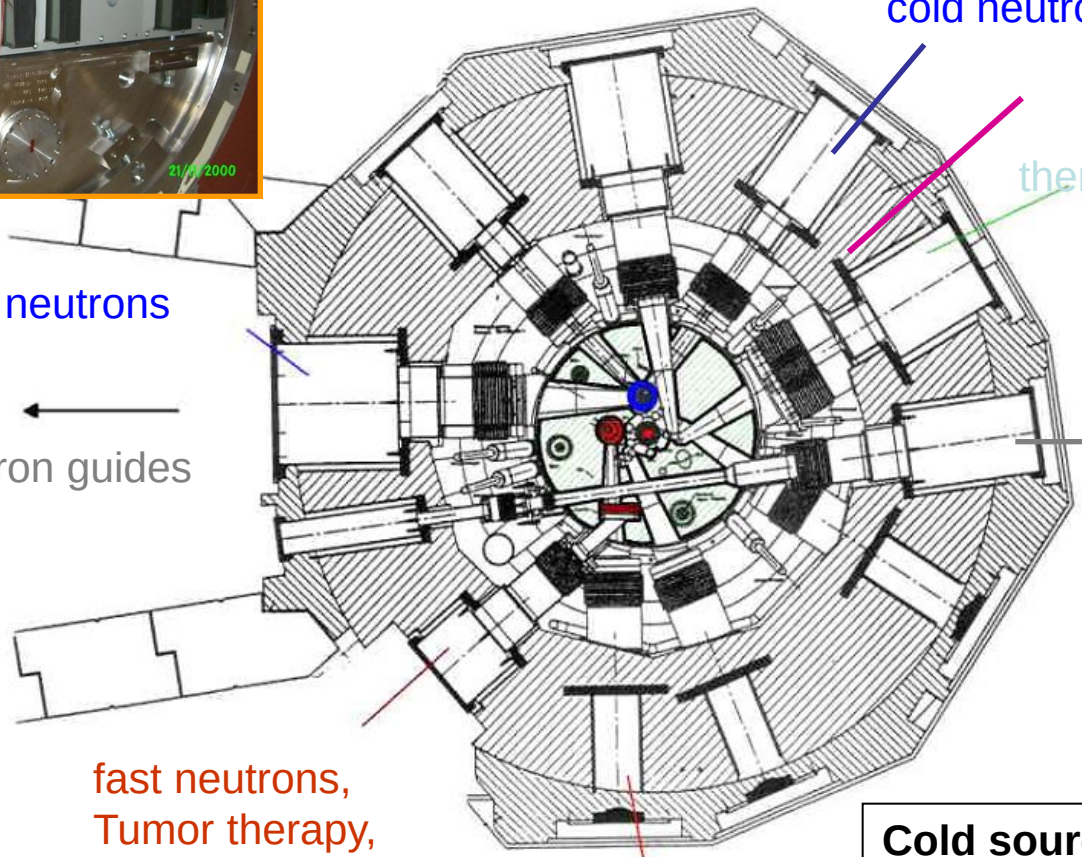
Forschungsneutronenquelle Heinz Maier Leibnitz (FRM II)

Forschungs-Neutronenquelle Heinz Meier Leibnitz (FRM II)

- thermal power 20 MW
- unperturbed flux: 8 x 10^{14} n/cm²s
- swimming pool, 700 m^3 H_2O,
- pressureless, T ~ 35°C
- D_2O moderator
- external neutron beams by beam tubes & neutron guides
- 30 instruments
- several irradiation facilities
- ca. 1000 scientists/a
- access by scientific merit
- factor 2 over demand
- users 60% Germany, 40% international



Beam tube arrangement



cold neutrons

positrons

thermal neutrons

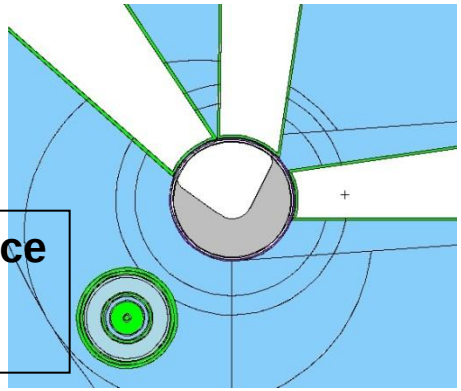
cold neutrons

Neutron guides

ultra cold neutrons

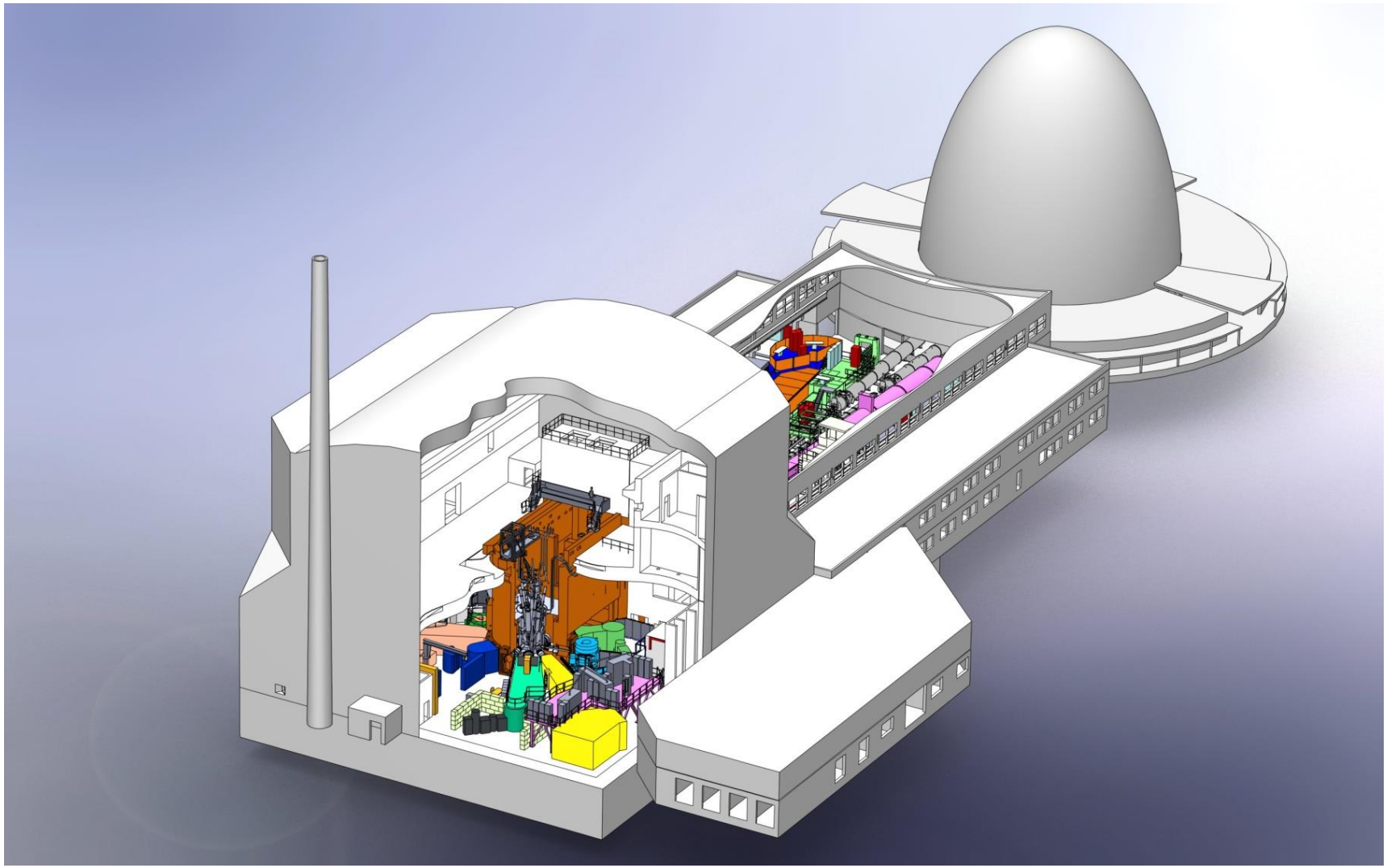
fast neutrons,
Tumor therapy,

hot neutrons



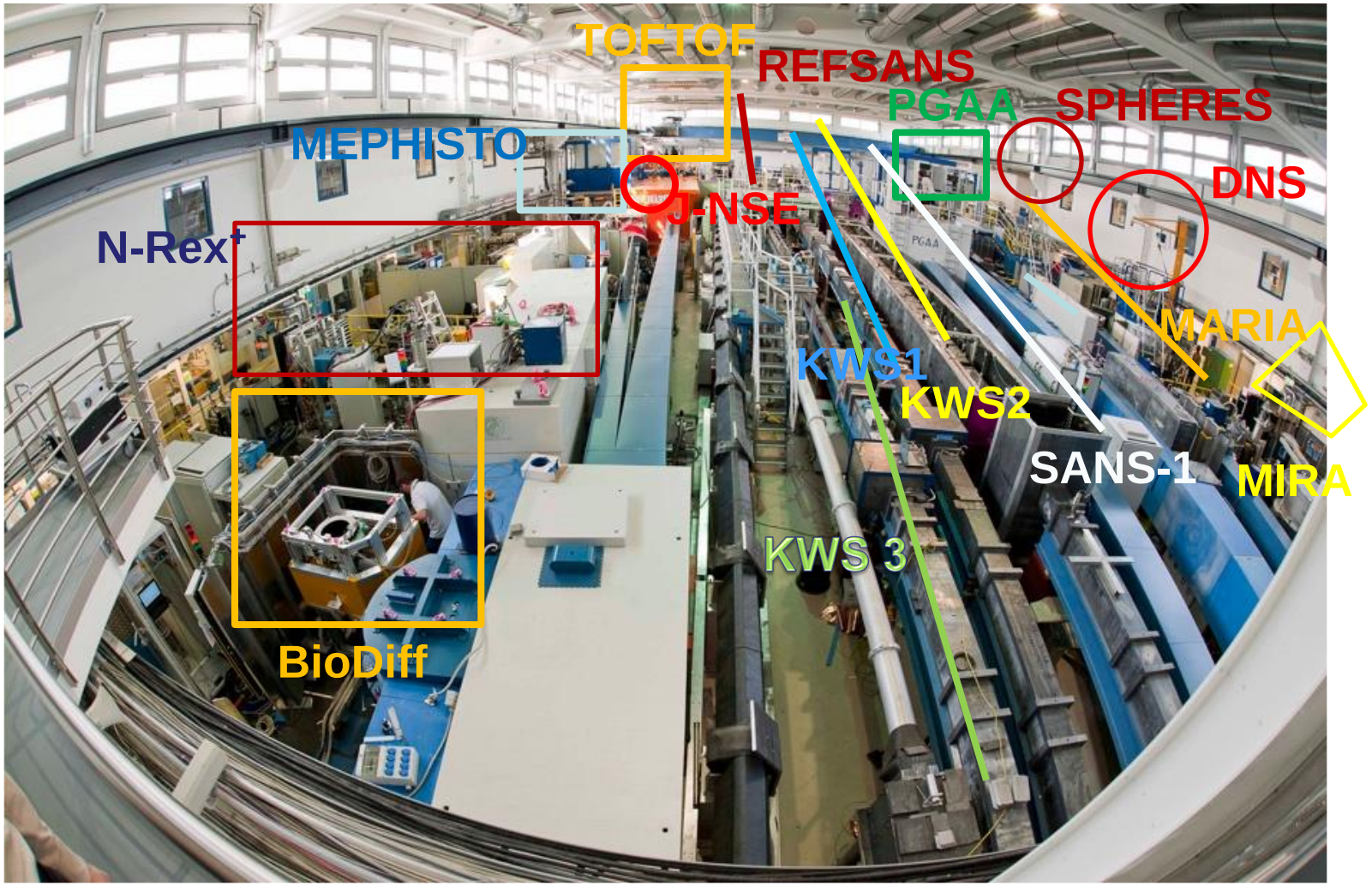
Cold source
15 l LD_2
T = 25 K

Experimental Areas



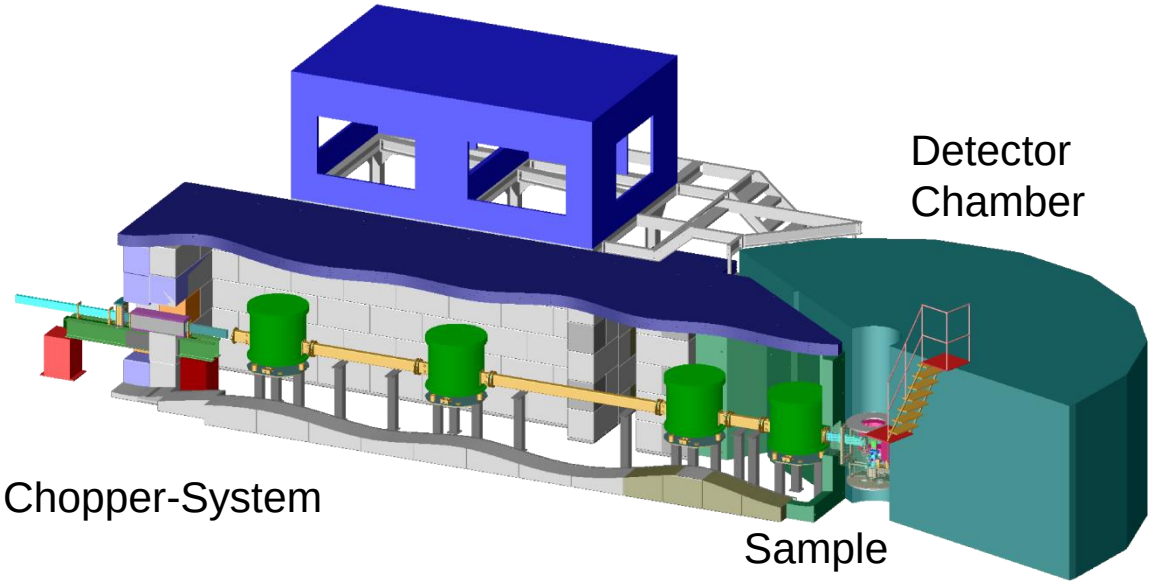
Experimental Hall

Neutronguide Hall West



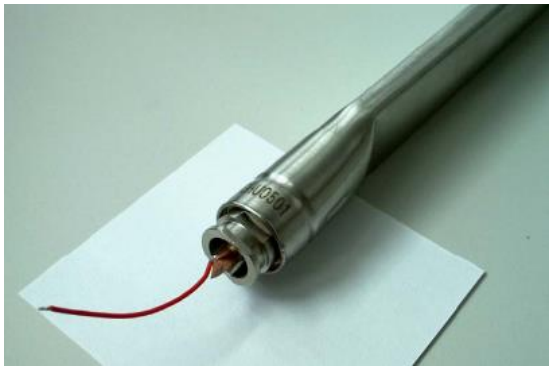
^{3}He: Proportional Counter

Double Time-of-Flight Spectrometer ToFToF @ FRM II



Detectors

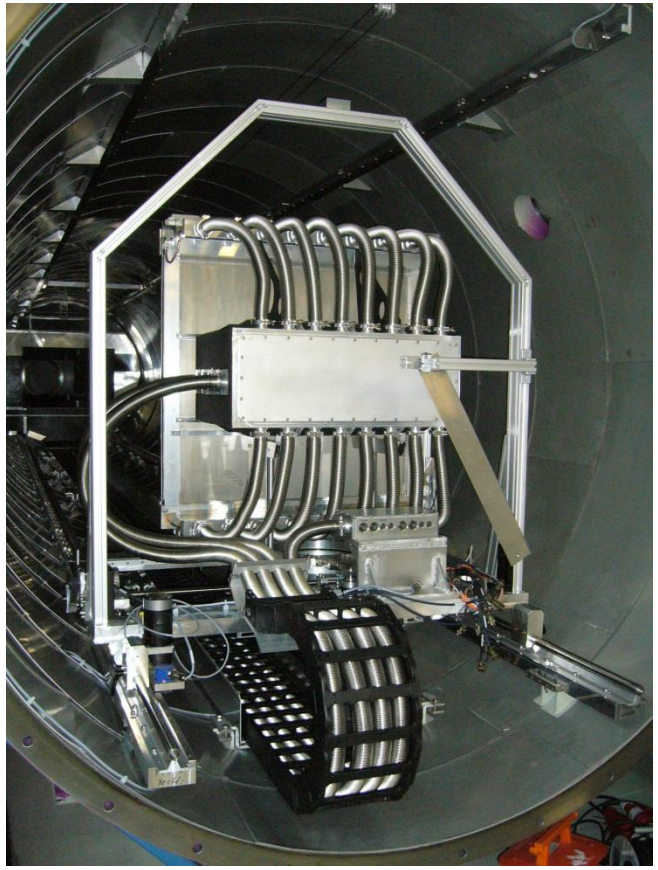
- 1000 detectors
- 10 bar ^{3}He
- 40 cm x 3 cm x <1.3>



Instrument Specific Projects: He-3 PSDs

SANS-1 detector

Active Area: 1000 mm × 1000 mm
Resolution: $\Delta x = \Delta y \approx 8$mm
Global count rate: ≥ 1 MHz
Local count rate: ~ 100 kHz / wire
Efficiency: ≥ 70 % for λ = 6 Å



128 position sensitive ^{3}He-Detectors

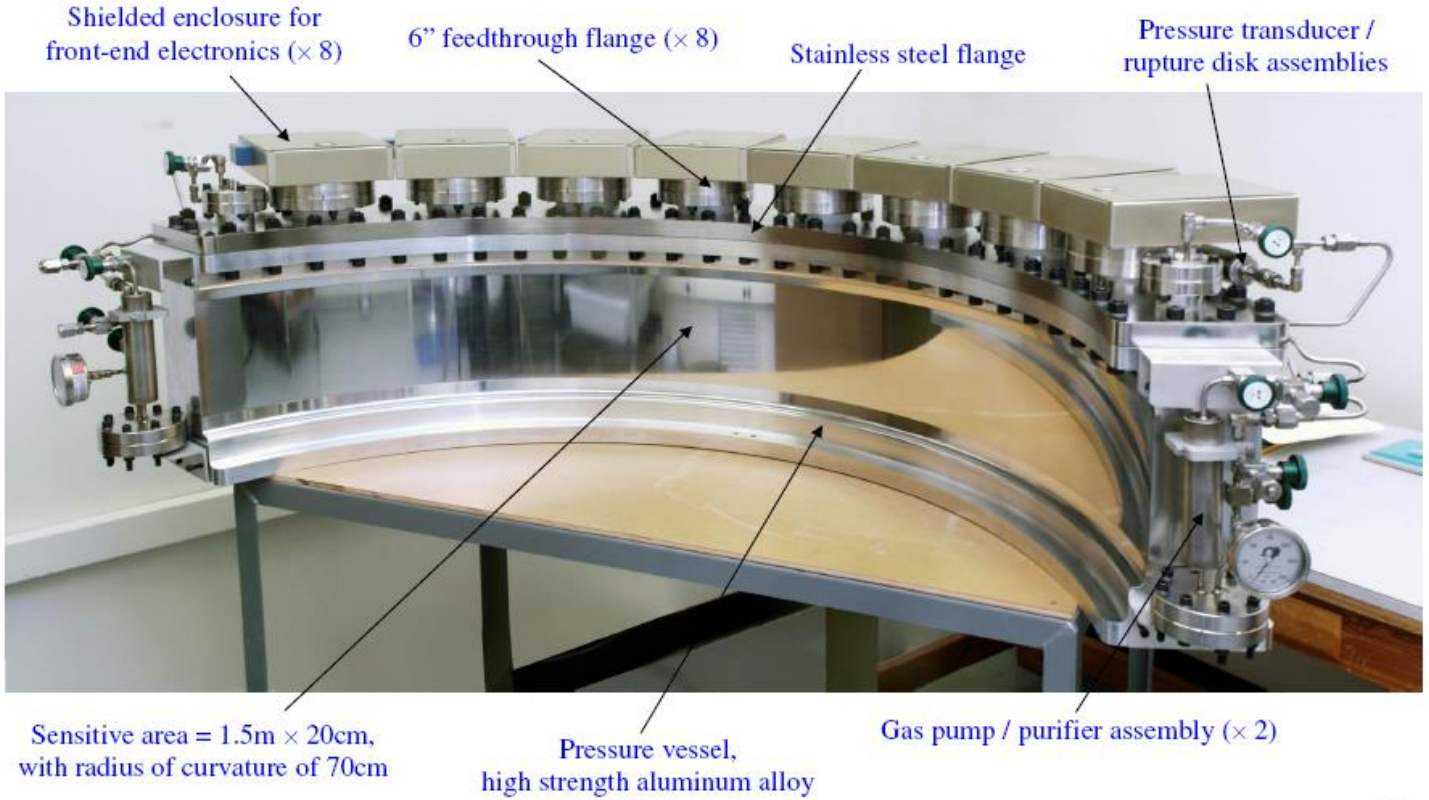
Typ: PSD: RS-P4-0341-201 (15bar ^{3}He)
Length: 1000 mm
Diameter: 7.9 mm

New Projects for Instruments:

SPODI-II: Curved Detector

120° Two-Dimensional Thermal Neutron Detector for Protein Crystallography

- 0.3 m^2 area, $>10^5$ resolution elements, 1.5 mm FWHM
- Single gas volume, continuously sensitive readout
- Timing resolution → 0.15Å wavelength bandwidth
- 8 independent. wire segments → modularity, high count rate, $> 10^6\ s^{-1}$
- Encoding electronics optimized for high throughput, low noise
- Decoding with high performance digital signal processing



INSTRUMENTATION DIVISION

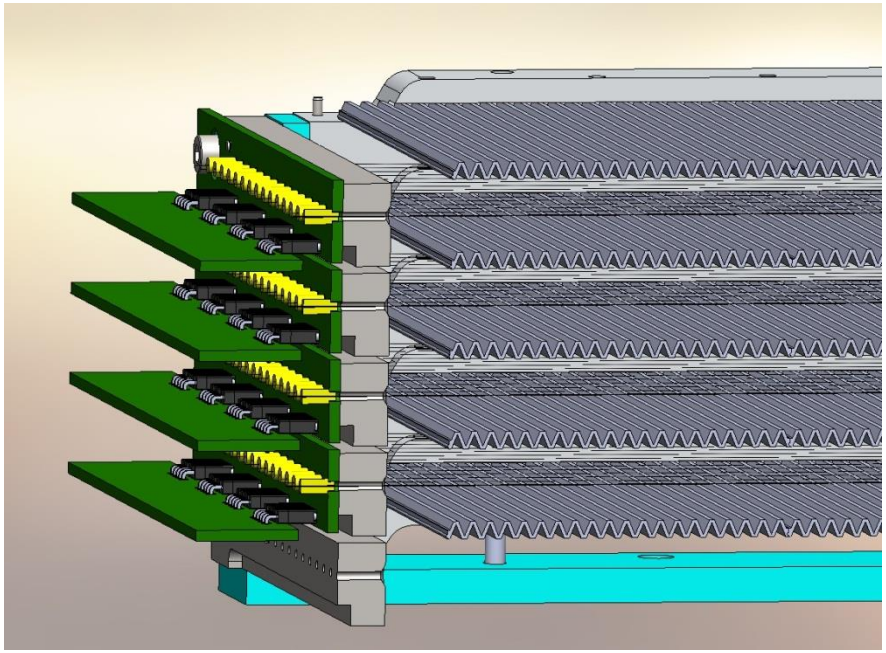
BROOKHAVEN NATIONAL LABORATORY

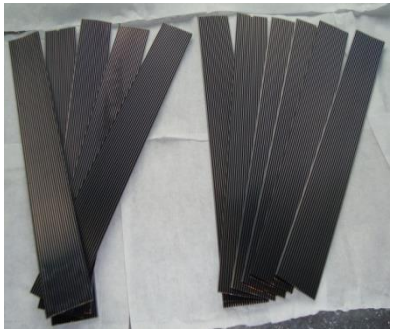
Concept study for a large area ^{10}B- detector

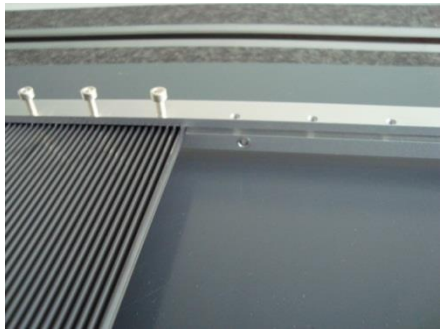
FRM II
Forschungs-Neutronenquelle
Heinz Maier-Leibnitz
Technische Universität München

Collaboration with ESS & Linköping Univ.

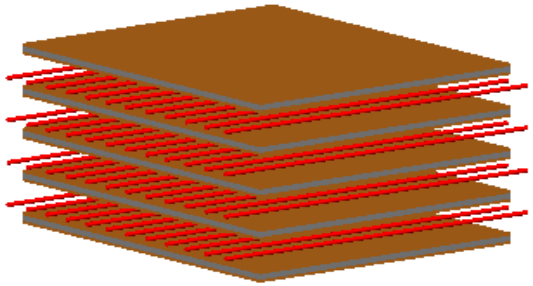
Evaluate medium size detector based on a multiple MWPC with grooved converter for medium resolution







MWPC stack



Demonstrator design:

- Active Area 40 x 40 cm^2
- fully modular design
- up to 5 MWPC
- Anode wire pitch: 5mm
- Anode – Cathode Gap: 7mm
- 0.5mm Al-Cathode: 2.1 mm grooves
  1.5 µm B_4C coating
- New Resistive anode wire readout concept for 2D - position resolution*

Final Goal for a B10-based detector:

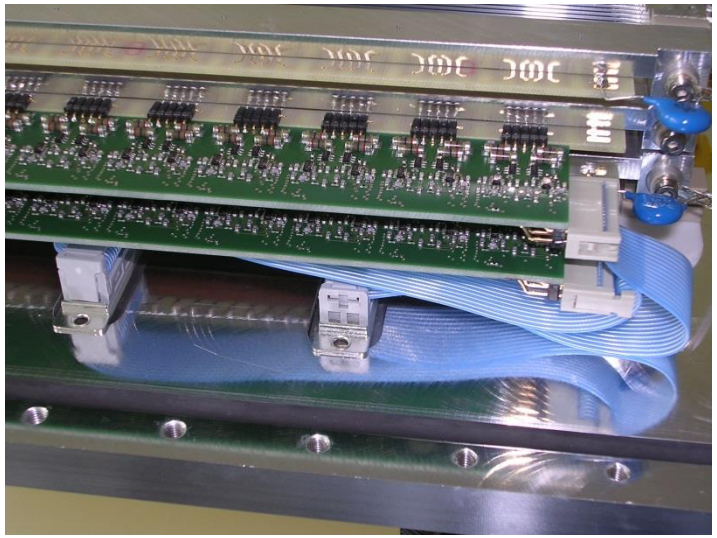
- Efficiency ≈ 50% for 1.8 Å (10 MWPC)
- Position resolution ≈ 5 x 5 mm

* In collaboration with mesytec GmbH

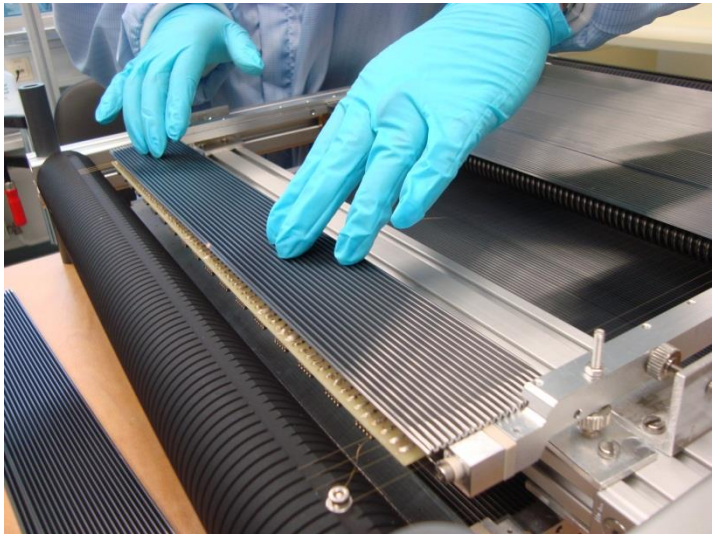
Gaseous Detector with solid ^{10}B converter

Assembly of a 40cm x 40cm Demonstrator

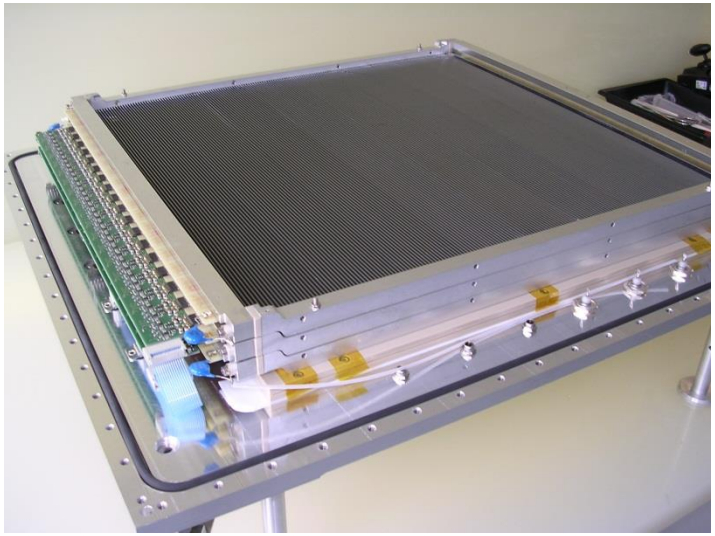
- Demonstrator with two anode wire grids and three macro-structured converter planes
- Converter coated double-sided with 1.4 µm $^{10}B_4C$ by magnetron sputtering
- Resistive readout of Stablohm 875 anode wires
- Stack assembly mounted in a gas tight box



Inserting the converter plates



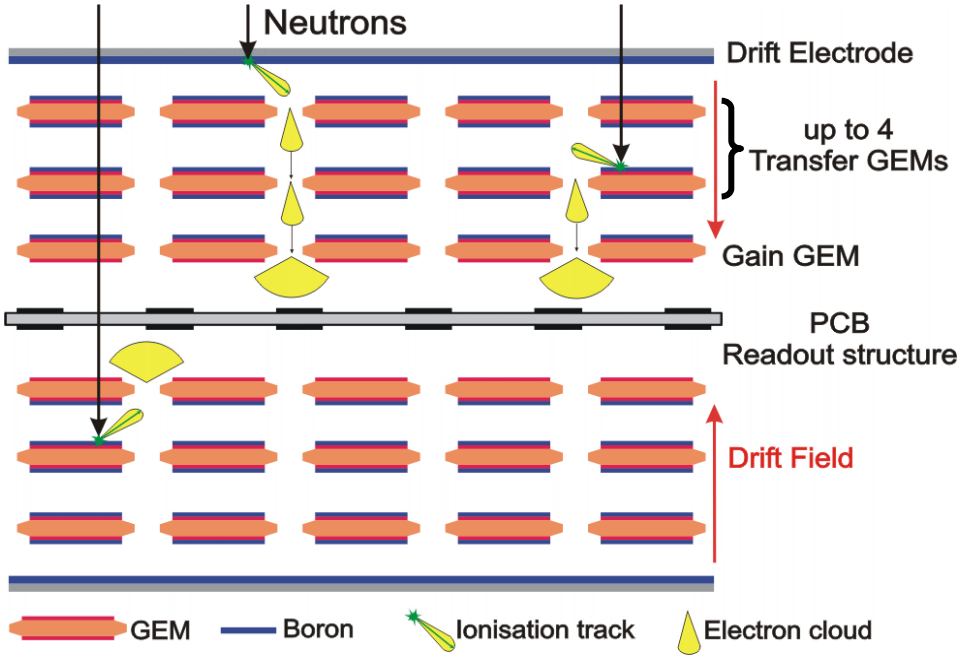
Stack of MWPC modules



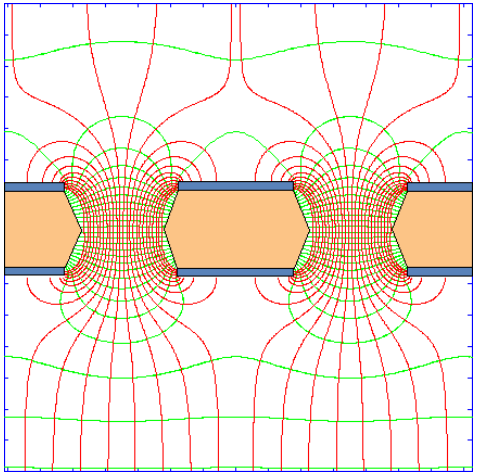
Solid ^{10}B-converter in gaseous detectors

"CASCADE"-Detector
developed at Univ. Heidelberg
stack of B-coated GEM foils

Area: 20x20cm^2
High rate: > MHz
Fast timing: 100 ns



M. Klein, Univ. Heidelberg



Sauli et al.: http://www.cern.ch/GDD