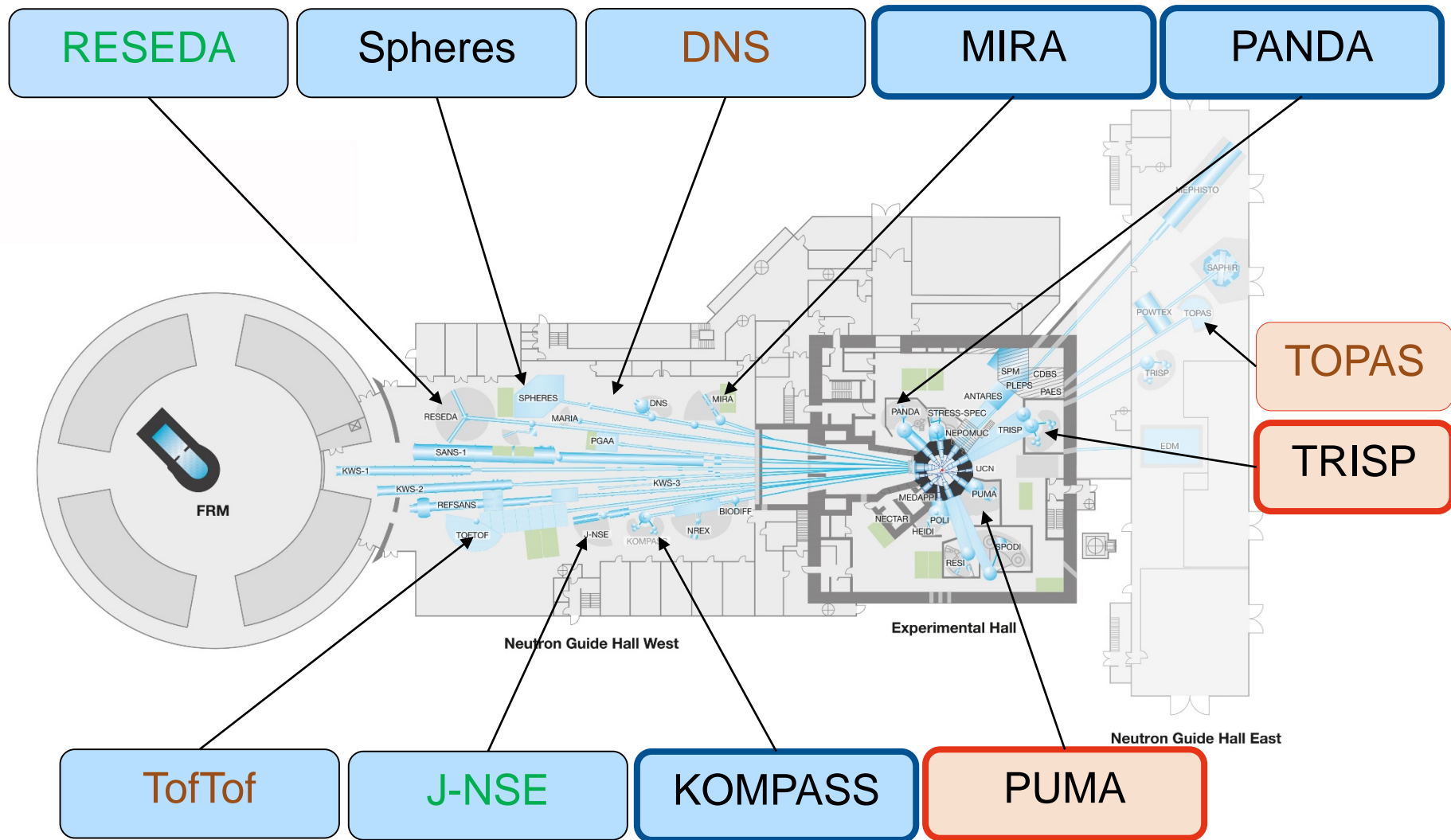


Current instrument suite (TAS) at the FRM II

Peter Link, Spectrina 2020
11.11.2020

MLZ is a cooperation between:

Spectroscopy Instrument Suite at MLZ



Spectroscopy Instrument Suite at MLZ

- Instruments on thermal source:

PUMA, high(est) flux on beam tube SR7

TRISP, high resolution on beam tube SR5 with 10 m SM neutron guide

- Instruments on cold source

PANDA, high flux TAS on beam tube SR2

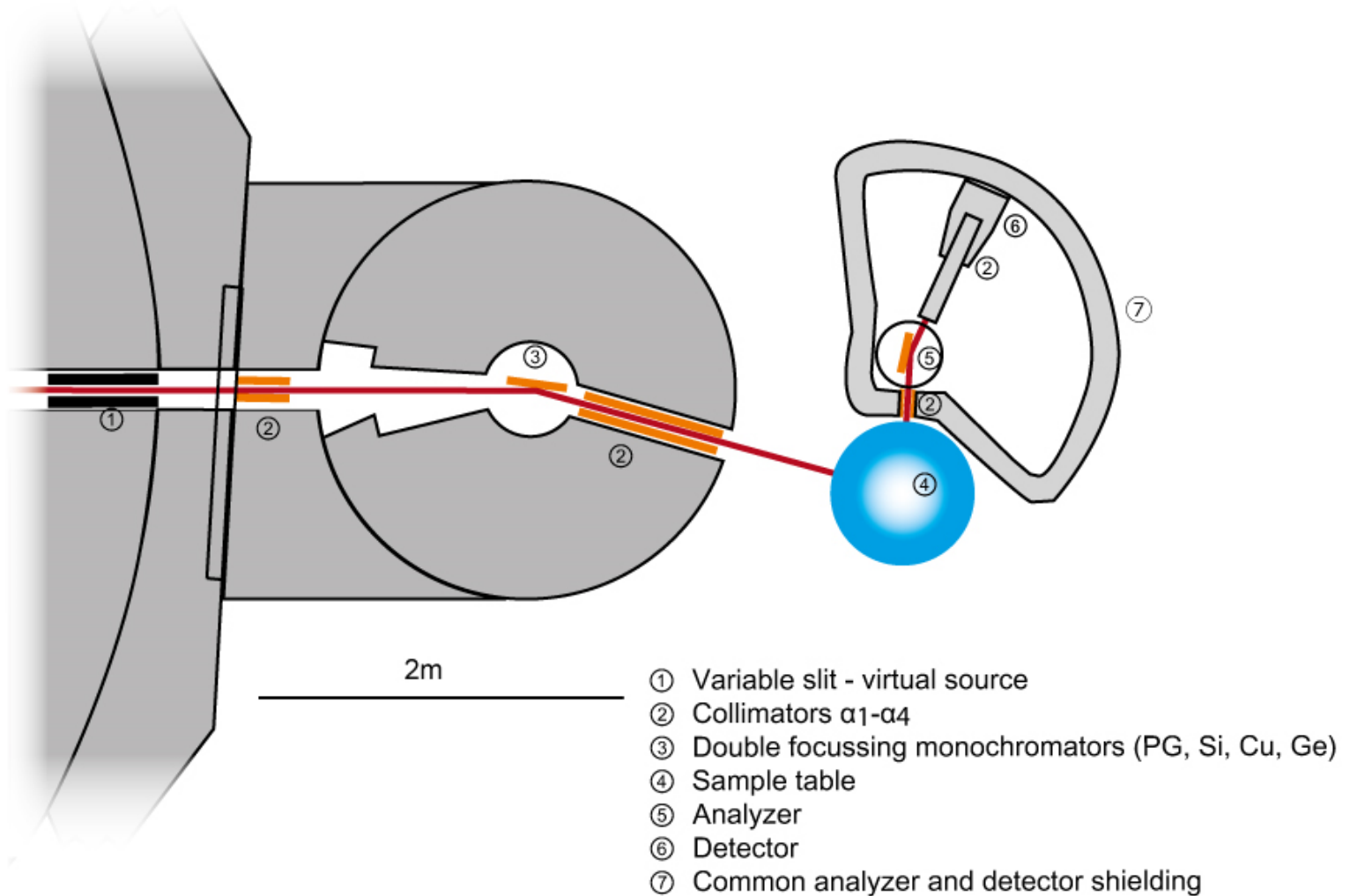
MIRA, on cold neutron guide NL6-S, high resolution fixed ki
(in design phase LaDiff, cold TAS and Larmor diffractometer)

KOMPASS, on cold neutron guide NL1 (end position)

fully polarized neutron TAS

PUMA

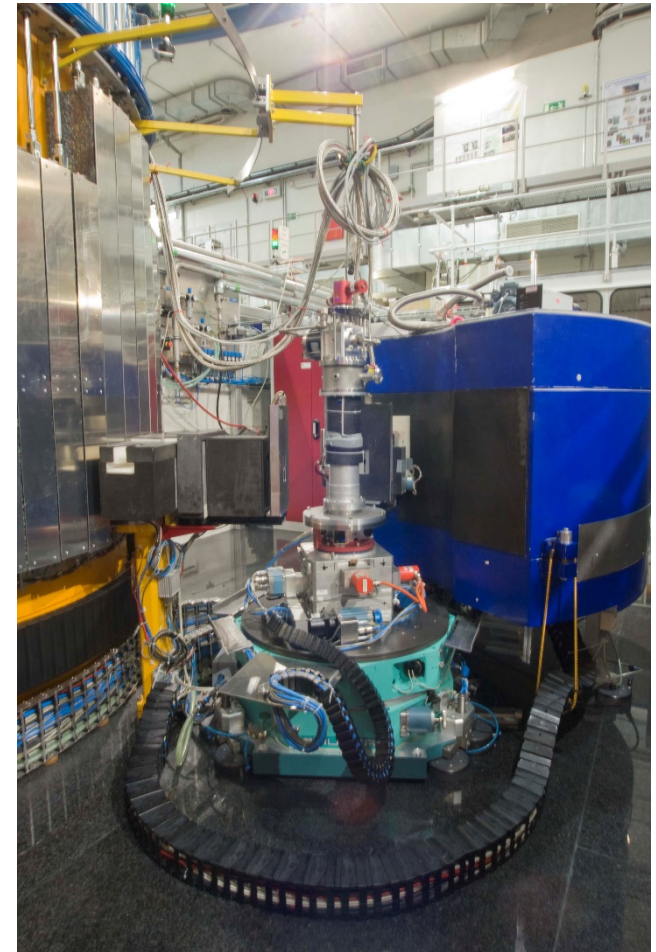
Thermal TAS with Polarization Analysis and Multianalyzer



PUMA

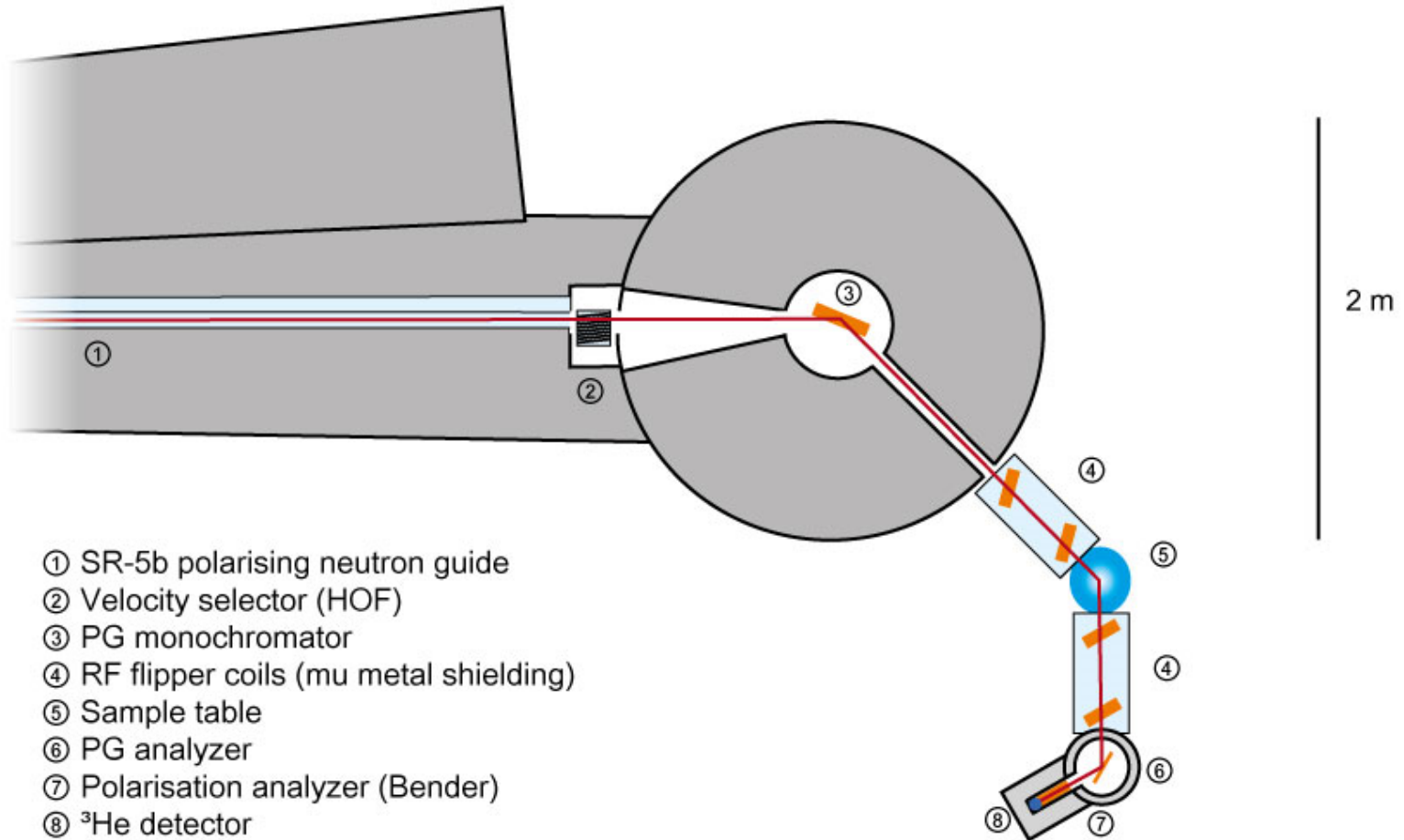
Thermal TAS with Polarization Analysis and Multianalyzer

- Thermal Beamtube SR7
- Compact design for highest flux
- Double focussing Monochromators
PG(002), Cu(220), Cu(111), Ge(311)
 $5 \text{ meV} < E_i < 160 \text{ meV}$
- Horizontal focussing Analyzers
PG(002), Ge(311)
 $\Delta E < 100 \text{ meV}; \Delta q < 12 \text{ \AA}^{-1}$
- Multianalyzer / Multidetectoroption
- Stroboscopic Measurements for kinematic experiments
- Polarization analysis with ^3He spin filter (MEOP)



TRISP

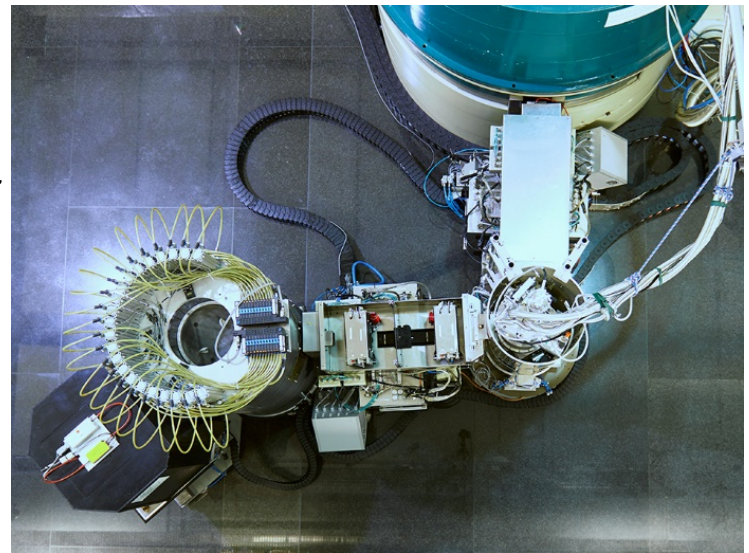
High Resolution Thermal TAS (NRSE)



TRISP

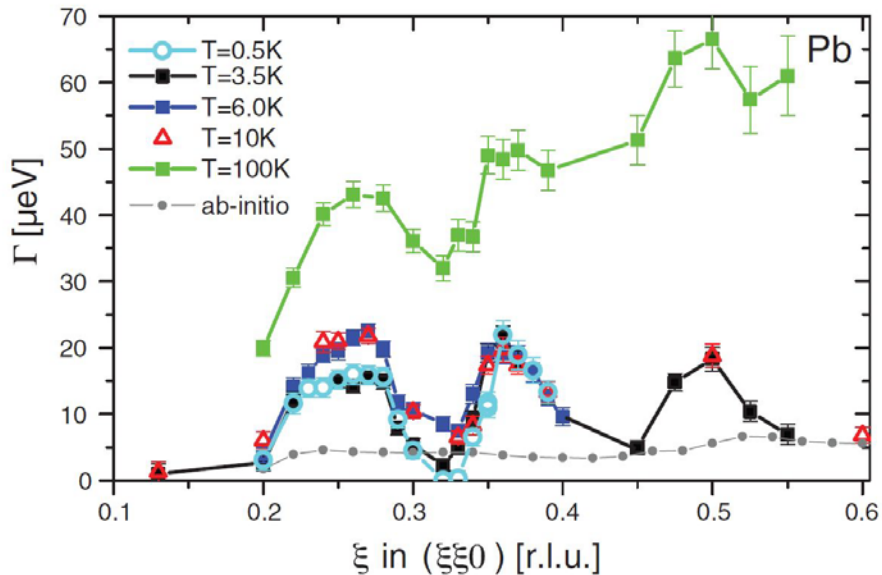
Key features

- Thermal Beamtube SR5
- Polarizing SM Bender
- Double focussing PG(002) or (004) Monochromator
 $1.3 \text{ \AA}^{-1} < k_i < 7.0 \text{ \AA}^{-1}$
- Astrium Velocity Selector as HOF
- Horizontal focussing PG(002) or Heusler (111) (polarized) Analyzer
- Mu metal caged NRSE spin echo coils



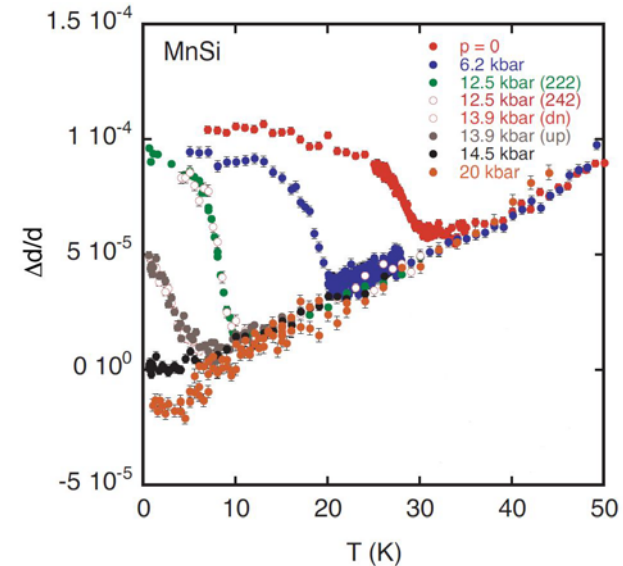
TRISP

Typical Applications



Measurement of Phonon or Magnon Linewidth

P. Aynajian et al., Science 319, 1510 (2008)

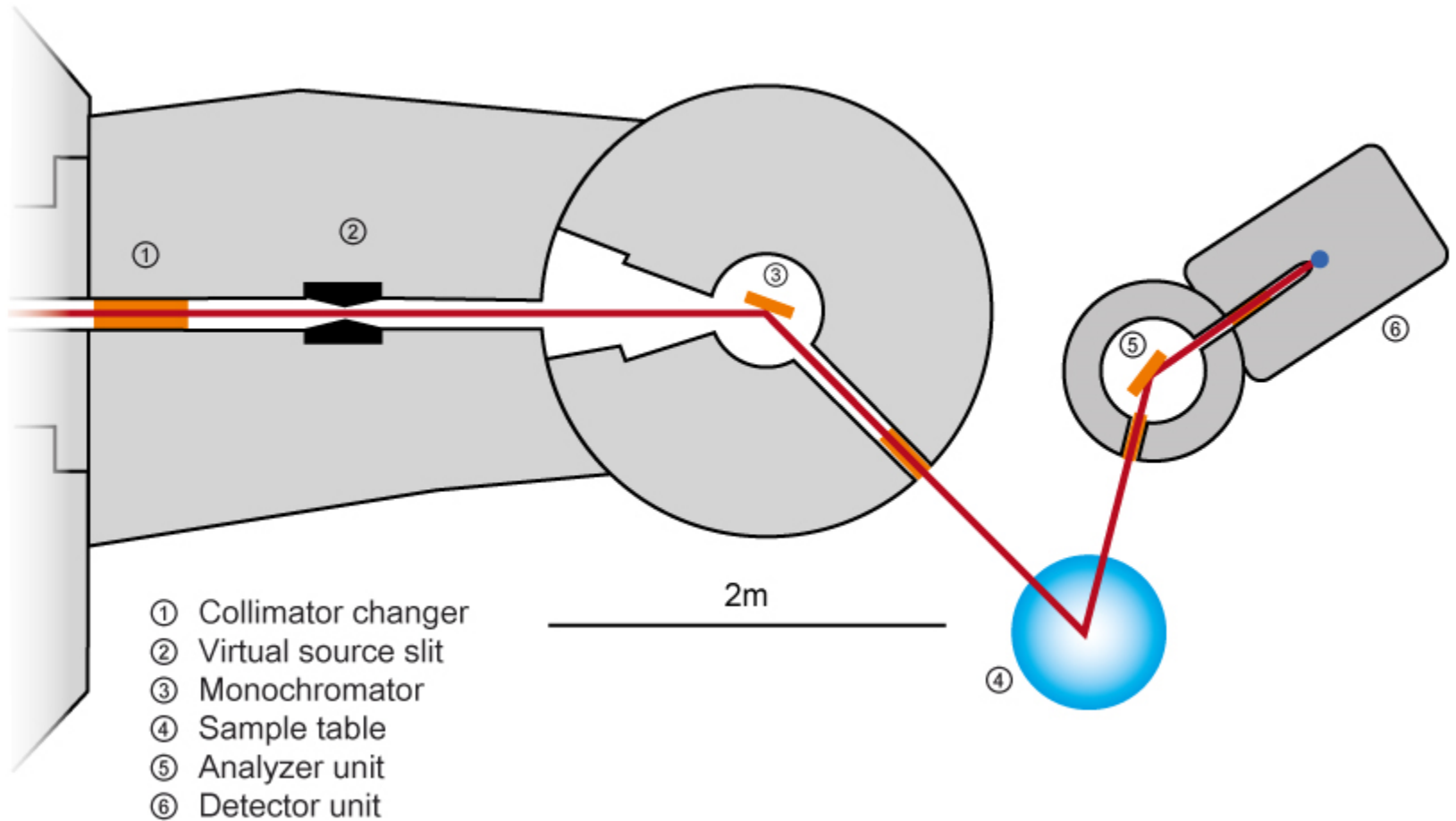


Larmor Diffraction

C. Pfleiderer et al, Science 316, 1510, (2008)

PANDA

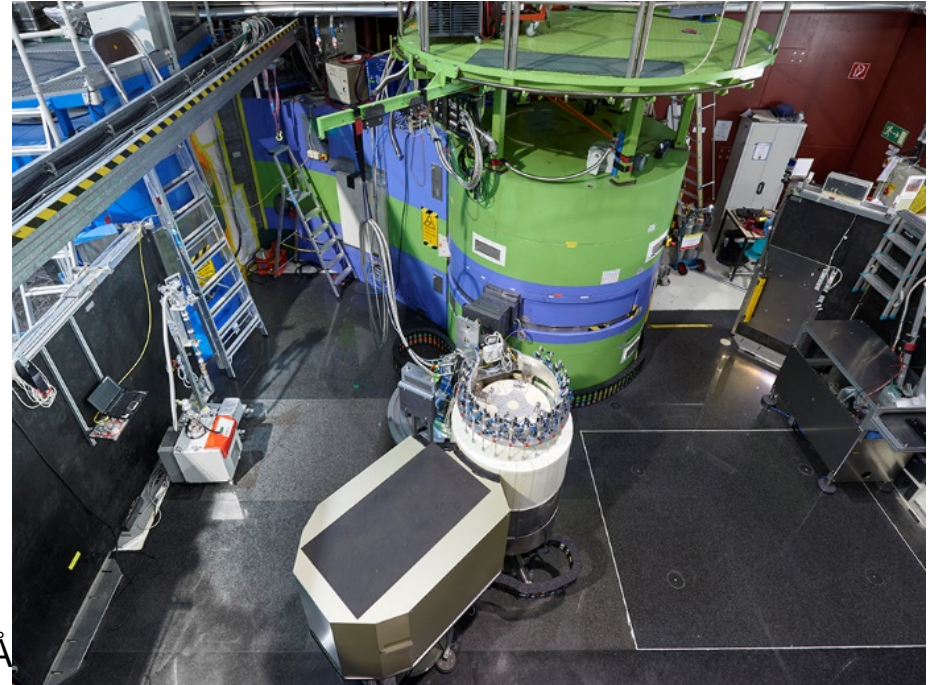
High Flux Cold Neutron TAS



PANDA

Key features

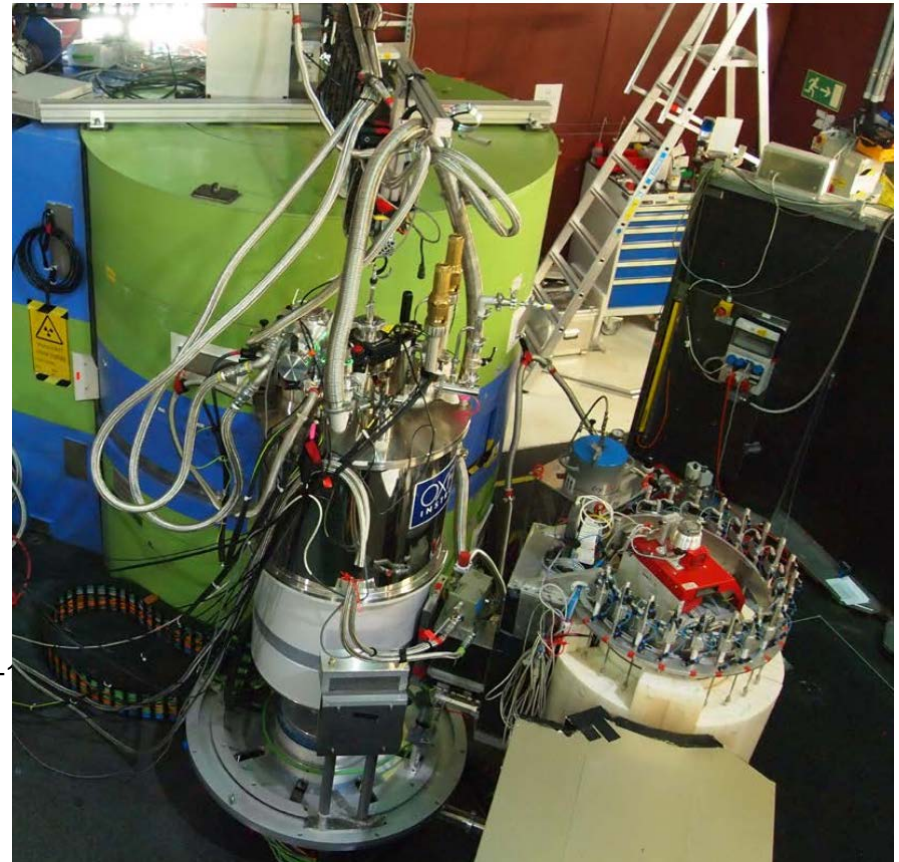
- Cold Source Beamtube SR2
- Double focussing Monochromators
PG (002), Heusler (111) pol.
 $1.1 \text{ \AA}^{-1} < k_i < 4.0 \text{ \AA}^{-1}$
- Horizontal focussing PG(002) or
Heusler (111) (polarized) Analyzer
- $\Delta E < 20 \text{ meV}$; $\Delta q < 6 \text{ \AA}^{-1}$
- Higher order filters:
PG ($l = 60 \text{ mm}$); $k_f = 2,57 \text{ \AA}^{-1}$ or $2,662 \text{ \AA}^{-1}$
Be (closed cycle cryostat, $T \leq 45 \text{ K}$); $k_f = 1,55 \text{ \AA}^{-1}$
BeO (liq.-N₂); $k_f = 1,33 \text{ \AA}^{-1}$
- Vertical magnetic field up 12 T available
- In commissioning: BAMBUS multi-analyzer backend



PANDA

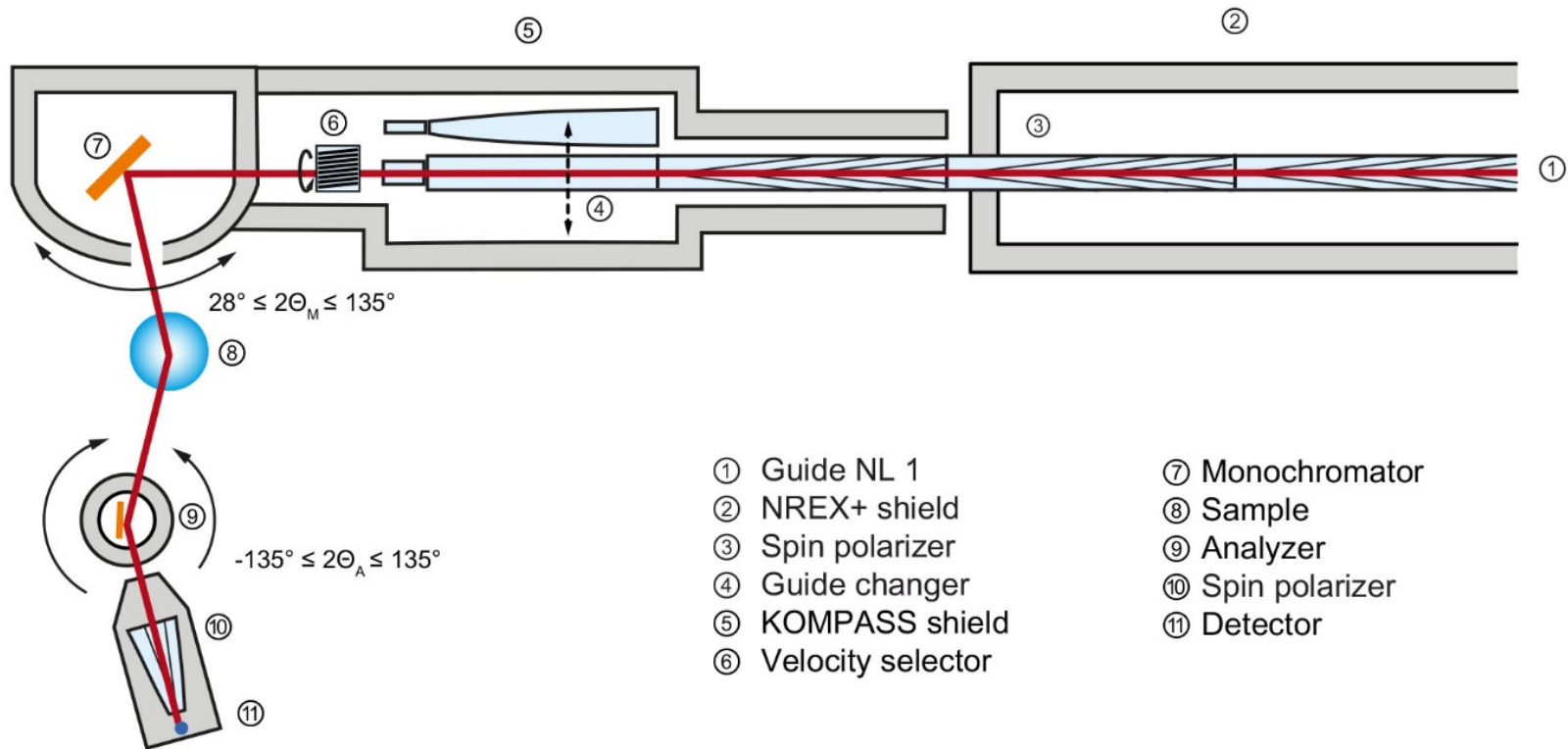
Key features

- Cold Source Beamtube SR2
- Double focussing Monochromators
PG (002), Heusler (111) pol.
 $1.1 \text{ \AA}^{-1} < k_i < 4.0 \text{ \AA}^{-1}$
- Horizontal focussing PG(002) or
Heusler (111) (polarized) Analyzer
- $\Delta E < 20 \text{ meV}$; $\Delta q < 6 \text{ \AA}^{-1}$
- Higher order filters:
PG ($l = 60 \text{ mm}$); $k_f = 2,57 \text{ \AA}^{-1}$ or $2,662 \text{ \AA}^{-1}$
Be (closed cycle cryostat, $T \leq 45 \text{ K}$); $k_f = 1,55 \text{ \AA}^{-1}$
BeO (liq.-N₂); $k_f = 1,33 \text{ \AA}^{-1}$
- Vertical magnetic field up 12 T available
- In commissioning: BAMBUS multi-analyzer backend



KOMPASS

Polarized Neutron Cold Neutron TAS



KOMPASS – Fully Polarized Cold Neutron TAS

Detectors:

- 2" 3He-detector
- 1" PSD tube

Monochromator and Analyser:

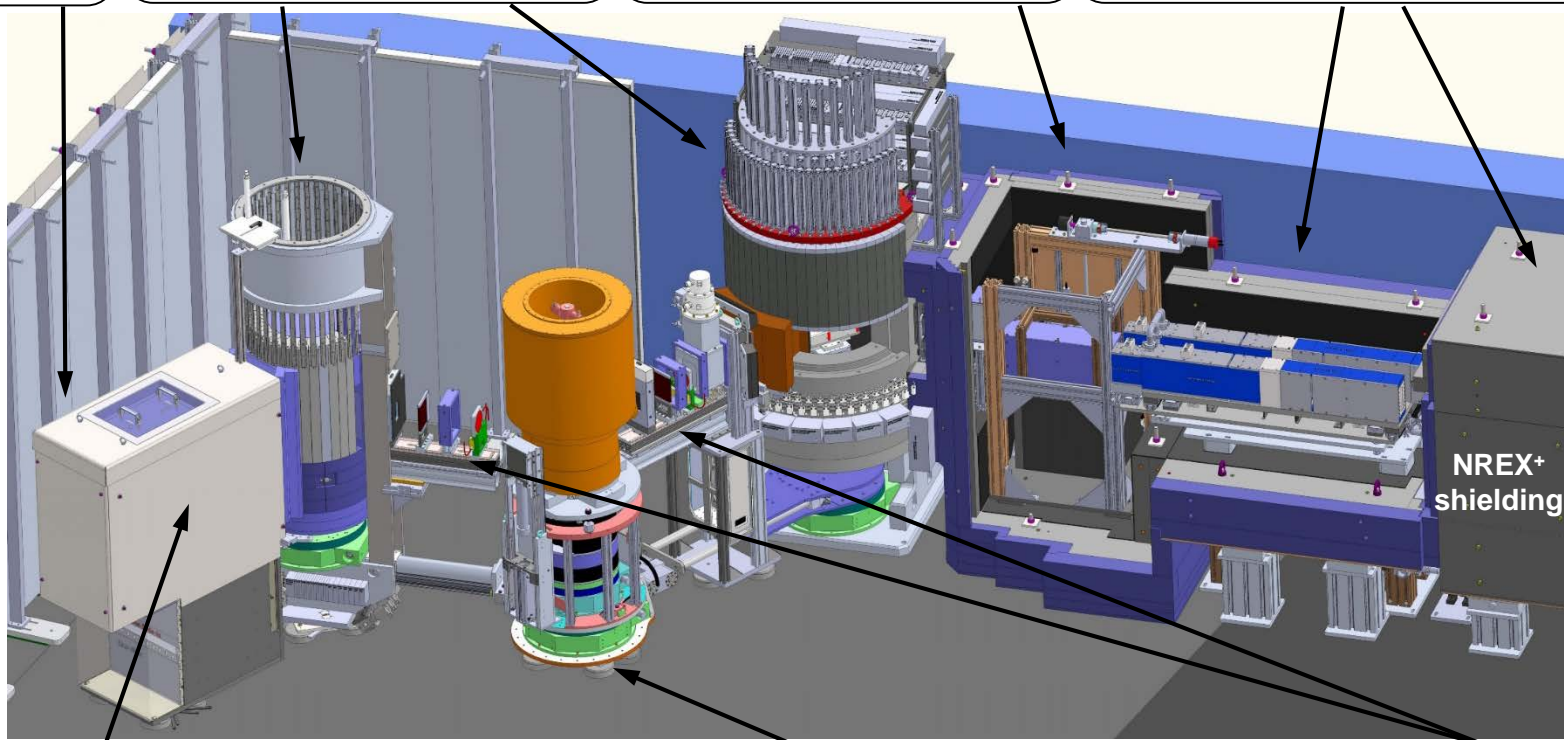
- HOPG (002)
- $k_i \approx 1.04 \sim 3.5 \text{ \AA}^{-1}$; $2\Theta_{\text{mon}} = 28\text{-}128^\circ$
- Doubly focusing

Lift:

- Velocity selector, $\Delta\lambda/\lambda = 31\%$
- 2nd position with straight neutron guide

Polarizing guide system:

- 3 serial polarizing V-cavities, $P > 98\%$
- Motorized, exchangeable straight and parabolically focusing guide front ends



Polarization analyser:

- Single V-cavity (15 channels)
- Double-sided Fe/Si coated silicon wafers, $m = 4.2$
- Optional Heusler analyser

Motorized sample table and sample environment:

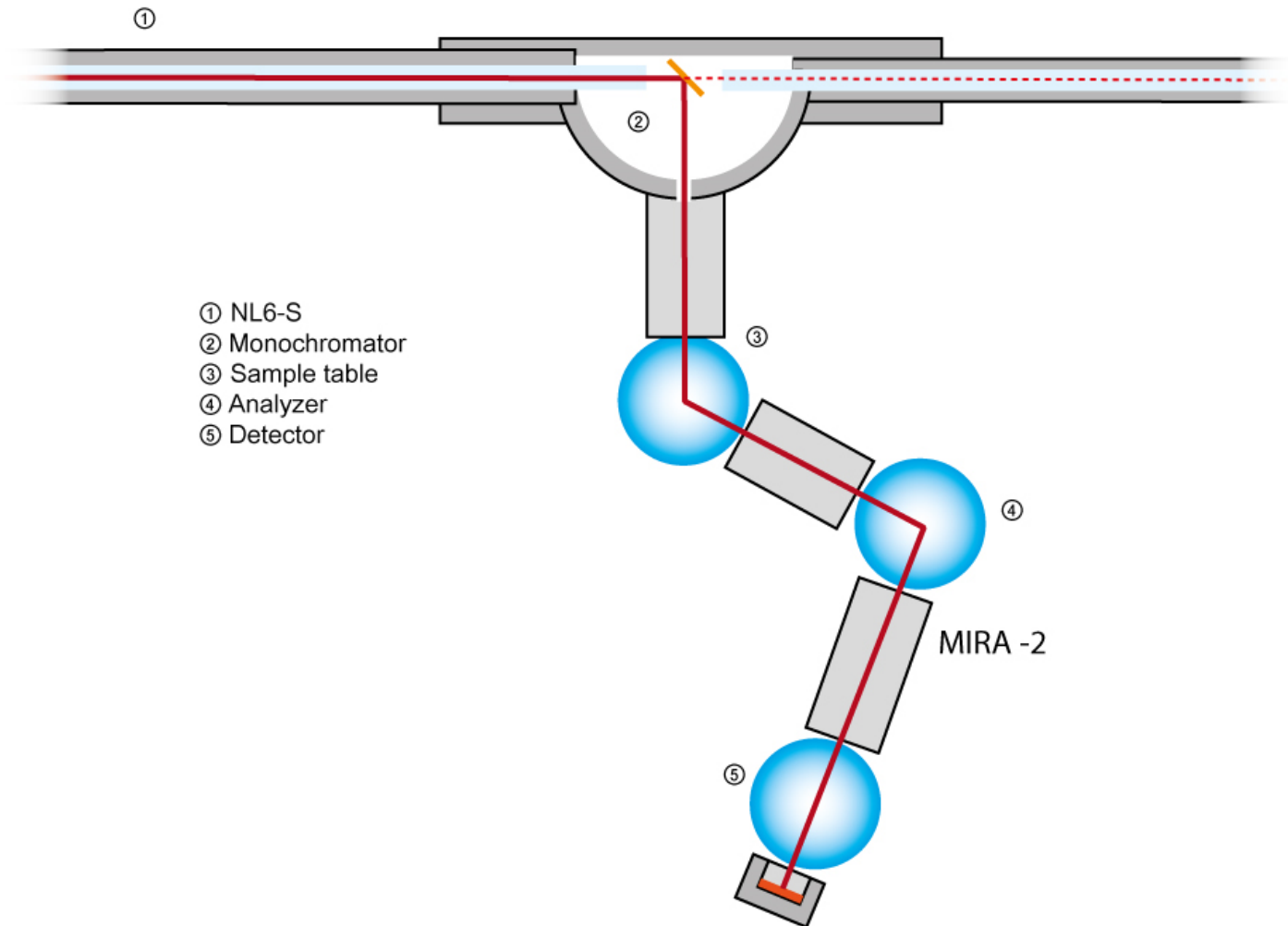
- Helmholtz coils for longitudinal polarization analysis
- CryoPAD for spherical polarization analysis
- Top and bottom-loading cryostats
- Option for time-resolved experiments in AC-electric field

Optical benches:

- Actively cooled Be-filter
- Monitor (fission chamber)
- Motorized diaphragms
- Flat coil spin flipper

MIRA

High Resolution Cold Neutron TAS



MIRA

Key Features

- Neutron guide NL6-S
- Horizontal focussing PG(002) Monochromator
fixed $1.2 \text{ \AA}^{-1} < k_i < 1.6 \text{ \AA}^{-1}$
- Horizontal focussing PG(002) Analyzer
- $6 \text{ meV} < \Delta E < 3 \text{ meV}$

Various Options available:

Cavities or S-Bender, transmission polarizers
 ^3He -spin-filter (MEOP)

$20 \times 20 \text{ cm}^2$ 2-D PSD with $1 \times 2 \text{ mm}^2$ resolution
1" ^3He detector tube
 $20 \times 20 \text{ cm}^2$ 2-D PSD, time resolved $< 1 \text{ ps}$

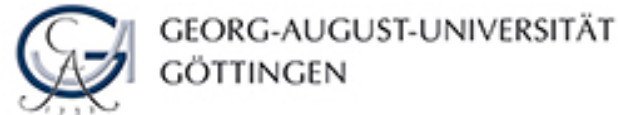
MIEZE setup for spin-echo



Thank You for your attention

PUMA

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Technische Universität München

TRISP

T. Keller, B. Keimer



MAX-PLANCK-GESELLSCHAFT

PANDA

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MIRA

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