

TRISP: Three axes spin echo spectrometer

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Abstract: TRISP, operated by the Max-Planck-Institute for Solid State Research, is a high-resolution neutron spectrometer combining the three axes and neutron resonance spin echo (NRSE) techniques.

1 Introduction

The design of TRISP is optimised for the study of intrinsic linewidths of elementary excitations (phonons, magnons) with an energy resolution in the μeV region over a broad range of momentum and energy transfers. Compared to conventional three axes spectrometers (TAS), this corresponds to an improvement of the energy resolution of one to two orders of magnitude.

TRISP also incorporates the Larmor diffraction (LD) technique, which allows to measure lattice spacings with a relative resolution $\Delta d/d = 1.5 \cdot 10^{-6}$, i.e. one to two orders of magnitude better than conventional neutron or X-ray diffraction. Absolute d -values can be determined by calibrating the instrument against an Si standard. The main applications of LD include thermal expansion under pressure and low or high temperature, and distributions of lattice constants (second order stresses). LD thus is unique in a parameter region, where standard methods such as dilatometry fail.

2 Typical Applications

- Measurement of the intrinsic linewidths of phonons
- Measurement of the intrinsic linewidths spin excitations
- Larmor diffraction is used to determine thermal expansion and second order stresses under pressure and at low or high temperature

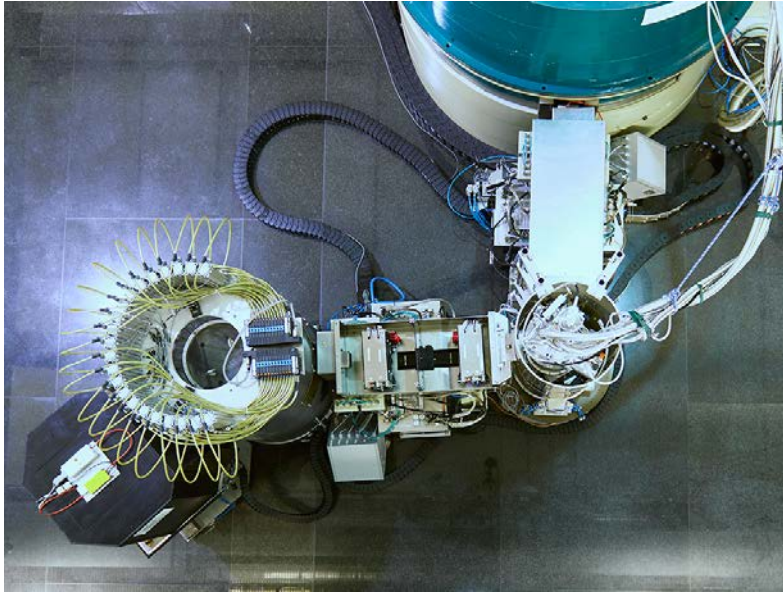


Figure 1: Instrument TRISP (Copyright by W. Schürmann, TUM).

3 Sample Environment

Besides the standard sample environment a dedicated dilution cryostat with a base temperature of 6 mK is available.

4 Technical Data

4.1 Primary beam

- thermal beam tube SR-5b
polarising supermirror bender
 $1.3 \text{ \AA}^{-1} < k_i < 7.0 \text{ \AA}^{-1}$
- Velocity selector
Astrium type, as higher order wavelengths filter

4.2 Monochromator

- PG(002) or (004)
variable focussing horizontal and vertical

4.3 Analyzer

- PG(002)
variable horizontal focussing
- Heusler (111) (polarised neutrons)
variable horizontal focussing

4.4 Spin echo

- Resonance spin echo, enclosed by mu-metal magnetic screen.

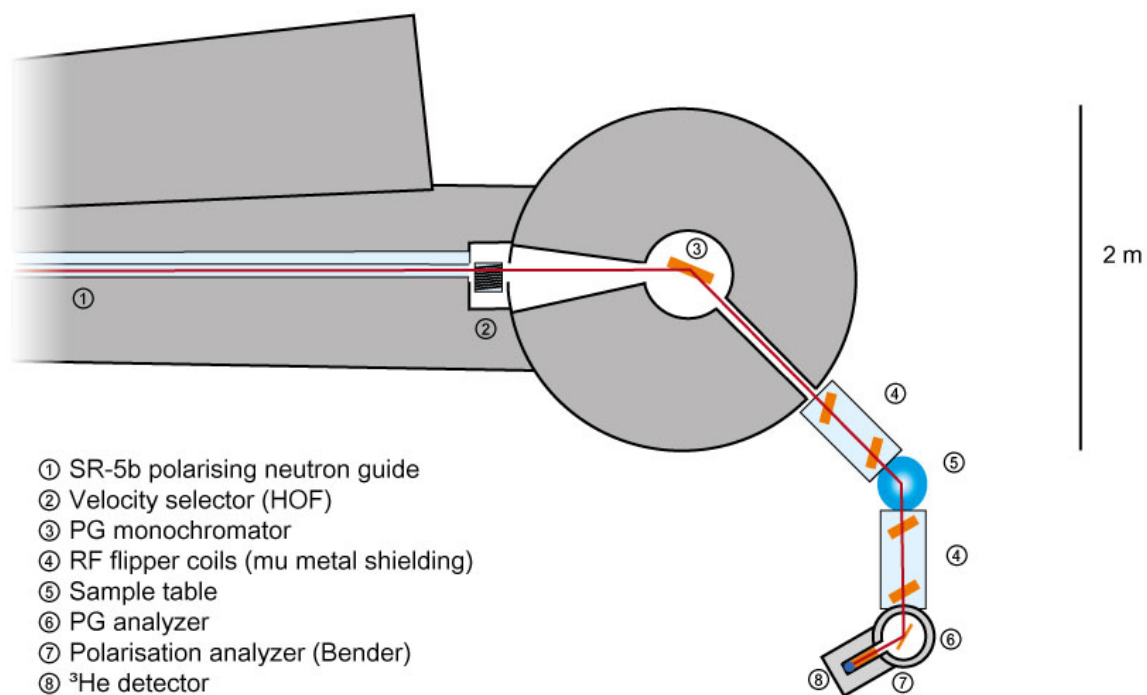


Figure 2: Schematic drawing of TRISP.