Improvements and Performance of the Two-Axes Neutron Diffractometer TOPSI

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TOPSI is a multy-purpose instrument for test experiments with cold neutrons. In the basic set-up it is a two-axes diffractometer with the opportunity to insert or add modules in between monochromator and sample position, on the sample table, and at the 2θ-drive.

In the recent years TOPSI was partially reconstructed and old components were replaced. Now the monochromator (with shielding) and the sample-table with ω- and 2θ-rotation stages form the basic two-axes set-up. Most of the sockets for connecting the modular equipment are positioned underneath the sample table.
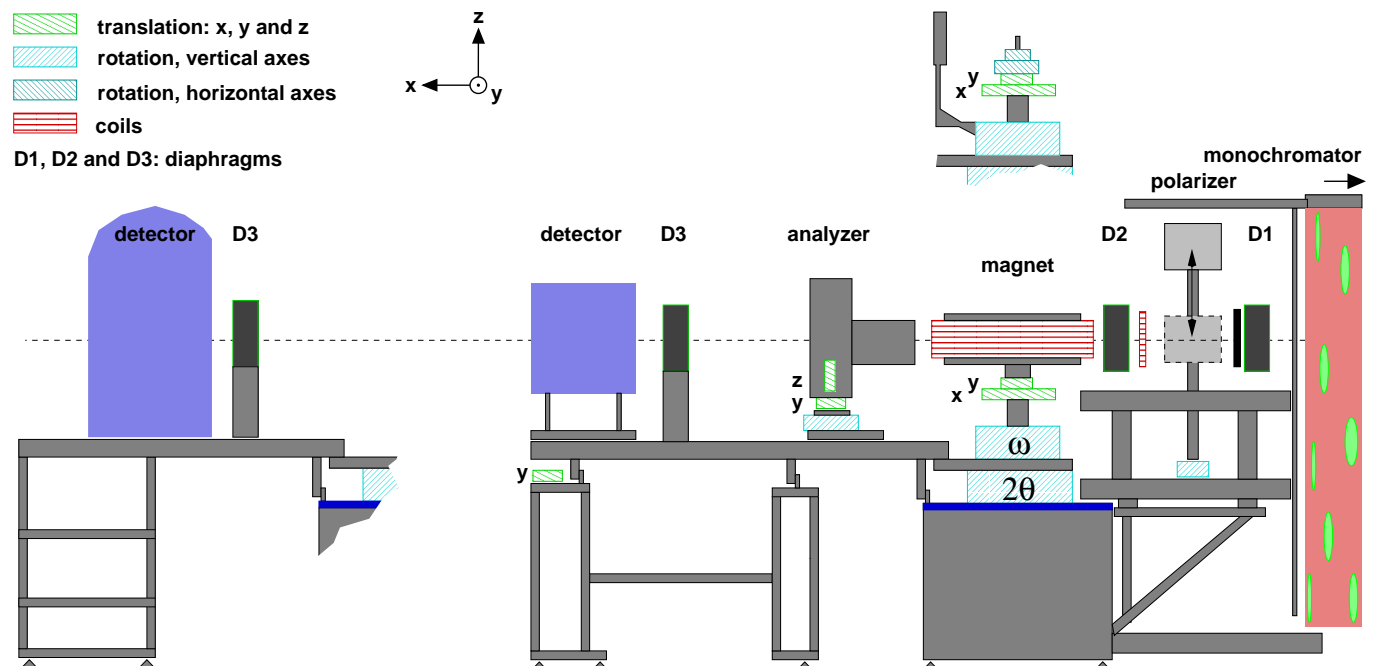
The main improvements are

• the much more stable ω- and 2θ-rotation stages, allowing for heavy sample environmet and a more precise positioning (both are encoded directly on the axis),

• the new polarizer magnet mounted on a lift to allow for a quick introduction of the polarizing option,

• a switchable polarization analyzer, and

• a much better shielding of the detector, reducing the background by one order of magnitude.

In addition to the standard set-ups for (non-) polarized reflectivity and single crystal diffraction (as shown in figure **??**), several test-experiments can be performed as e.g. topo-tomographie (N. Kardjilov) or characterisation of prototypes as the tests of an analyzer/detector segment for the backscattering instrument MARS.

From 2003 on a Bonse-Hard camera for ultra small angle neutron scattering will be a permanent option, allowing for $2.5 \times 10^{-5}\,\text{Å}^{-1} < q < 3 \times 10^{-4}\,\text{Å}^{-1}$.

basic features	
monochromators	graphite (002) & (004)
	Si (111), etc.
wavelenth-range	$2.3\,\text{Å} < \lambda < 6\,\text{Å}$
flux maximum	$\approx 4\,\text{Å}$
scattering plane	horizontal
2θ-range	up to $130°$
intensity	$2 \cdot 10^4 \text{s}^{-1}\text{cm}^{-2}$ (4.74 Å)
detectors	2 seperate ^{3}He scintillation tubes
software	SICS
diaphragms	3 motorized y-z-apertures
filters	cooled Be, graphite, supermirrors
collimators	soller-slits ($15'$ to $80'$)
reflectivity set-up	
dynamic range	10^5 to 10^6
polarization	transmission supermirror polarizer
	Mezei-type spin flipper
sample magnet	vertical or horizontal
	15 cm gap, 50 cm long,
	$-1000\,\text{Oe} < B_z < 1000\,\text{Oe}$
analysis	switchable transmission polarizer
option	multy reflection set-up
diffraction set-up	
q-range	$0.2\,\text{Å}^{-1} < q = 4\pi/2d < 5.4\,\text{Å}^{-1}$
options	Euler cradle (4 circle diffractometer)
	x-, y-translation and x-, y-tilting
environment	standard SINQ-equipment
	e.g. CTI, APD

Figure 1: Standard set-ups for polarized reflectivity and single crystal diffraction (*left* and *top*). All elements in between monochromator and sample (X95-) and on the 2θ-arms (item-profile) can be removed easyly.