

Beam tube	Cold neutron guide G 6
Monochromator	Pyrolytic graphite, vertical focusing
Type of instrument	Two-axis diffractometer ("Tanzboden" type)
Maximum flux at the sample	3×10^6 neutrons $\text{cm}^{-2} \text{sec}^{-1}$ (ambient pressure version) 2×10^7 neutrons $\text{cm}^{-2} \text{sec}^{-1}$ (high pressure version)
Maximum beam size at the sample	10 x 30 mm
Incident wavelength	Between 4 and 6 Å
Removal of the $\lambda/2$ contamination	Beryllium filter
Angular range	$0 < 2\theta < 147^\circ$
Detector	Linear (BF_3) multidetector ("Banana" 0 type, 80°) with 400 cells

Detector and sample rotations and the data collection are made using a PC computer linked to the central SUN computer for the storage of data. On-line data treatments can be performed by a second PC computer installed near the first one.

Sample environment

Low temperatures	Cryostat (ILL type) : $1.5 < T < 300$ K Closed circle cryogenerator : $10 < T < 300$ K
High temperatures	Small furnace which replaces the inner part of the cryogenerator : $T < 300$ C High temperature furnace $T < 1300$ C
Magnetic fields	No
High pressure	Sapphire anvil cells $P < 10$ GPa Diamond anvil cells $P < 50$ GPa

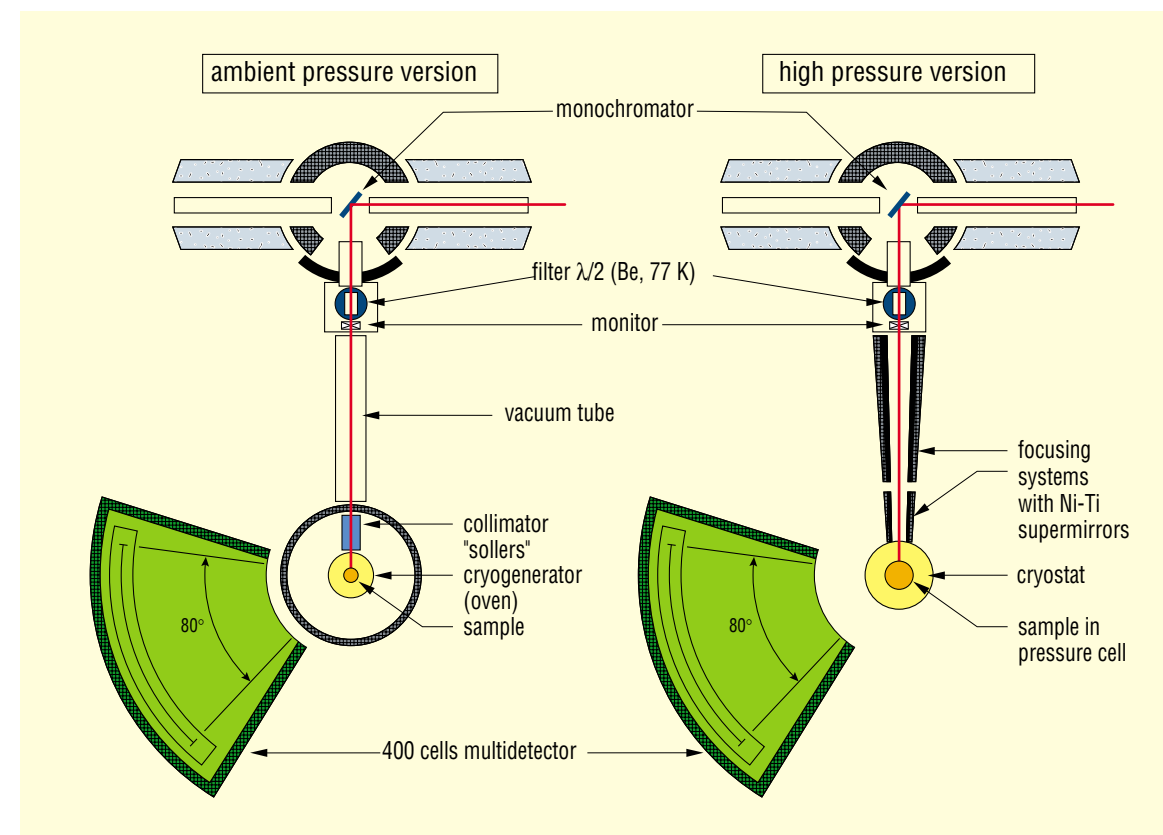
Note : all the pressure cells are compatible with the ILL-type cryostat. Pressure is applied outside of the spectrometer in the neighboring building. Pressure is measured by a ruby fluorescence at room temperature and kept constant during cooling.

G 6-1 is a two-axis powder diffractometer installed on a cold neutron guide. It is a high-intensity long-wavelength ($4 < \lambda < 6$ Å) instrument used to study magnetic structures, long-periodicity mesoscopic structures and diffuse scattering at ambient and high pressures. A monochromatic neutron beam is selected by a graphite monochromator. The typical incident wavelength is 4.74 Å and can be exceptionally changed in the above range. The contamination of the second harmonics ($\lambda/2, \lambda/3, \dots$) is suppressed by inserting a beryllium filter (cooled down to liquid nitrogen temperature) in the incident beam path. The diffractometer is equipped with a linear (banana-type) 400-cells multidetector covering 80 degrees of scattering angle. The multidetector and its protection can rotate around the sample axis, covering a total angle of 150 degrees.

The spectrometer operates in two different versions :

1) ambient pressure version

In this version, the incident neutron path is under vacuum. The sample, collimator and beam catcher are placed inside a large vacuum chamber. In this vacuum chamber, several types of sample environment may be inserted. Namely a cryogenerator ($10 < T < 300$ K), an ILL type cryostat ($1.5 < T < 300$ K), a small furnace ($T < 300$ C) easy to install with the same environment as the cryogenerator, or a more powerful furnace ($T < 1300$ C) similar to that used on 7 C2 diffractometer. An electromagnet could be also installed ($H < 1.5$ Tesla) but the instrument is not currently equipped with it. The option of polarized neutrons is now suppressed.



General layout of the diffractometer G 6-1.

Due to its high flux and resolution, but limited scattering vector range ($0.15 < q < 2.5$ Å⁻¹ in the typical configuration), this diffractometer is well adapted to the study of structural and magnetic phase transitions, diffuse scattering in disordered systems, specific features at low q 's in amorphous and liquid states, adsorbed layers, etc...

2) High pressure version

In this version the diffractometer is used to study magnetic order, phase transitions, mesoscopic structures (nanomaterials, polymers,...) in wide range of pressures $0 < P < 50$ GPa.

To study small samples at very high pressures a special double-stage focusing system with Ni-Ti supermirrors is installed along the incident beam path. The focusing system allows to

increase intensity at the sample place by a factor of 7 (with some reduction of angular resolution). The focusing angle in the horizontal plane can be varied allowing to choose an optimal ratio between intensity and resolution in each experiment. Additional protection is used to decrease background in experiments with small samples.

The diffractometer is equipped with various high-pressure cells with sapphire and diamond anvils. Available sample volume : from several mm³ (sapphire anvils) down to 0.01 mm³ (diamond anvils). The maximal pressures are up to 50 GPa (500 Kbar) for strongly scattering samples and 7 - 10 GPa (70 - 100 Kbar) for normal scatterers. A specially modified cryostat generates temperatures in the range $1.5 < T < 300$ K. Currently, there is no high-pressure high-temperature option.

Responsibles :

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