Cold Neutron Three Axis Spectrometer

Areas are given Width × height
Beam tube Right beam of tangential channel 4 F
Monochromator Double monochromator set-up
M1 : pyrolytic graphite h = 0.4°
11x8.5 cm² computer controlled vertical focussing
M2 : pyrolytic graphite h = 0.4° 11x8.5 cm²
Analyzer Flat pyrolytic graphite h = 0.4° 7.5x8 cm²
Horizontally curved pyrolytic graphite 6x6 cm²
Collimators
In pile : 50°, 30°, 15°
between M1-M2 25° (optional)
others : 60°, 40°, 20°, 10°

Range of monochromator angle 31° < 2θ < 149°
Range of scattering angle -2° < φ < 150°
Range of analyzer angle 0 < 2θ < 150°
Range of crystal orientation 0 < ψ < 350°
Beam size at sample 2 x 4 cm²
Detector 3He Ø = 5 cm h = 15 cm
Incident wavelength (wave-vector) 2 < λi (Å) < 6.3 (3.2 > k_i (Å⁻¹) > 1)
Scattered wavelength (wave-vector) 1.6 < λf (Å) < 6 (4 > k_f (Å⁻¹) > 1.05)

Ancillary equipment
* Be filter (77 K)
* "Triple Axis Equipment Pool" (see on front of this chapter)

4F1 and 4F2 are twin 3-axis spectrometers with very similar characteristics (see description below), which are fed by a liquid-hydrogen cold neutron source. Polarized neutrons are only available on 4F1 (see 4F1 page).

These spectrometers are designed for measuring dispersive excitations with low energy transfers (w < 4 meV, n < 1THz) with a good resolution and a high flux (see Table). They are well suited for measuring acoustic phonon dispersions, soft phonons, spin waves, quasi-elastic scattering, as well as for fine studies of modulated structures. They are equipped with a double pyrolytic graphite monochromator, providing wavelengths between 6 and 2 Å (1.05 < k_i < 2.7 Å). Available collimators are (60°, 30°, 15°) before and (60°, 40°, 20°, 10°) after the monochromators. An optional collimator (25°, 15°) can be added between the two monochromators. The monochromator has a computer-controlled vertical focusing.

The incident beam can be filtered by a cooled Be or a graphite filter.

The pyrolytic graphite analyzer is normally used in a horizontally focusing geometry. In this mode, the curvature of the analyzer is controlled by the computer, and the collimators (60°, 40°, 20°, 10°) are replaced by wedge-shaped tunnels.

The sample table is equipped with two orthogonal non-magnetic goniometers, allowing tilts of ± 20°. Their upper face (serving as a support for the various sample environments) is located 270 mm below the axis of the beam.

The sample-to-monochromator and sample-to-analyzer distances can be adjusted to accommodate various sample environments.

The spectrometer is controlled by a SUN computer running under Unix/Solaris OB. It allows various data processing softwares, including fit and convolution programs, to be run in real time during the measurements.

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