Beam tube	G3 horizontally bent cold guide
Used wavelengths	5 Å - 10 Å (preferred wavelengths 6 - 8 Å)
Monochromation	Mechanical selector
	$\frac{\Delta\lambda}{\lambda} \cong$ 18% FWHM
Polarizer, analyzer	Supermirrors
	Polarization $P_0 > 92\%$
Focusing guides of the incident collimation	^{65}Cu guides
	Length : 1.8 m and 2 m
Peak intensity at the sample	0.5×10^6 n cm^{-2} s^{-1}
	(Typical size : 27 x 27 mm^2)
Length of precession fields	L = 4 m
Total number of turns	2 478
Precession current	2 A - 140 A
Maximum field integral	0.4 T.m
Spectral resolution	At 8 Å : $h\omega_{min}$ = 1 neV
	Fourier time ~ 40 ns
Sample to analyzer distance	≈ 6 m
Momentum transfert range	$1.5° \leq 2\theta \leq 90°$
	At 6 Å : 0.0274 Å^{-1} < Q < 1.5 Å^{-1}
	At 8 Å : 0.0205 Å^{-1} < Q < 1.11 Å^{-1}
Detectors	5 ^{3}He detectors
Ancillary equipment	★ Sample box (3 sample positions) Either fluid heater (- 20°C < T < 80°C) or resistive heater (20°C < T < 120°C)
	★ Furnace (1 sample) (T < 500°C)
	★ Orange cryostat 1.5 K

Neutron Spin Echo (NSE) is a particular technique in inelastic neutron scattering : both the incoming and outgoing neutron velocity (rather given components of these) are measured by using the Larmor precession of the neutron's spin. This technique allows to directly determine the intermediate scattering function, S (Q, t) of the studied sample.
The accessible time range is a few ten nanoseconds (energy transfer of a few neV). This technique is peculiarly well suited to measurements of non-dispersive elementary excitations.

The neutron spin echo spectrometry is a method of wavelength focusing, allowing to use a large energy range of incident neutrons ($\frac{\Delta\lambda}{\lambda}$ ~20% FWHM). This advantage compared to the classical inelastic techniques partly compensates the loss of intensity due to the length of the instrument and to the polarization analysis of the neutron spins.

In the quasi-elastic approximation, the measured quantity, the echo amplitude is proportional to :

$$\int S(Q,\omega)\cos\omega t\, d\omega = \check{S}(Q,t)$$

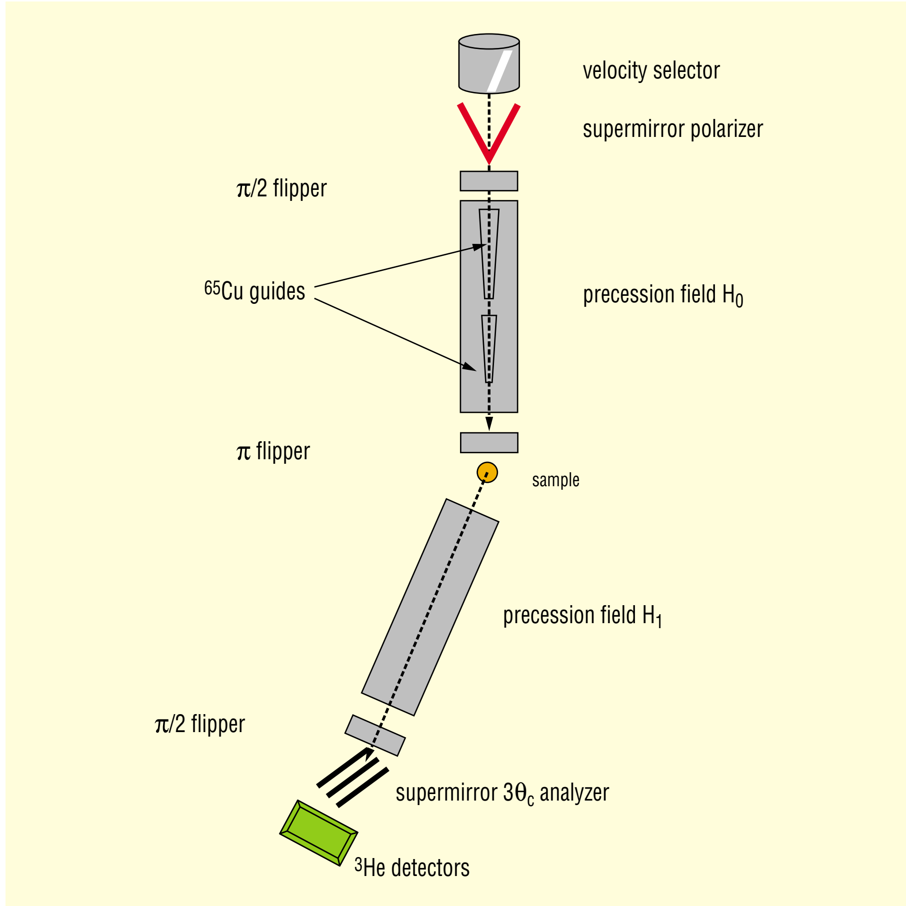
where t, the Fourier time, is expressed as :

$$t_{(sec)} = 1.863\ 10^{-16}.\ (\int_0^L H.dl).\ \lambda_0^3$$

H is the field in Oersted and λ_0 (in Å) is the mean incident wavelength. $\int_0^L$ H.dl is the field integral over the length L (in cm) inside the precession solenoids.

Besides the measurement of the echo amplitude, a classical polarisation analysis (three dimensional) can be performed in order to determine the coherent/incoherent contributions in S(Q, ω), to separate magnetic and nuclear signal…
Among the physical phenomena measured with MESS, we can mention :
- internal motion or diffusion of big molecules (biochemistry, polymers, membranes)
- magnetic scattering (paramagnetic, ferromagnetic, spin glass)..

This spectrometer has been built in collaboration with the KFKI (Science Academy Hungary).



General layout of the spectrometer G 3-2.

The neutron beam is roughly monochromatised by a velocity selector (Δλ/λ ~ 18%), then flipper turns the polarization perpendicular to the magnetic field H_0 of the first precession solenoid, so that the Larmor precession will start. The π flipper reverses the polarization so that the fields H_0 and H_1 (in the second precession arm) are in the same direction. After scattering by the sample, the neutron spin precess in the second precession field H1. At the end of the second solenoid, the neutron spin is turned again by the second π/2 flipper, parallel to the magnetic field in order to be analyzed. The spin-echo signal is recorded by several ^{3}He detectors.
Two guide elements coated with ^{65}Cu can be put in the first precession solenoid. This focusing device allows us to perform lower energy resolution measurements with higher neutron flux.
The whole length of the instrument and the high maximum field integral (0,4 T.m) lead to a high Q and ω resolution spectrometer.

On MESS, the Fourier time is expressed as :

$$t_{(ns)} = 2.341\ 10^{-7}.\ N_{sol}.\ I_p.\ \lambda^3$$

as function of the turn number (N_{sol}), the precession current (I_p) and the incident wavelength (λ).

Data acquisition and treatment are performed on PC computers working with Windows 98 or NT System.

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