Institut Laue Langevin - IN5 instrument
"Time of Flight" spectrometer

6tec ..

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General requirements for an upgrade of IN5

- Enhance the count rate
- Extend the set-up range (Ei, ΔE, Q, ΔQ)
- Improve the data quality (pulse shape, background, ...)
- Improve instrument reliability
- Extend the instrument possibilities
- Minimise instrument shutdown

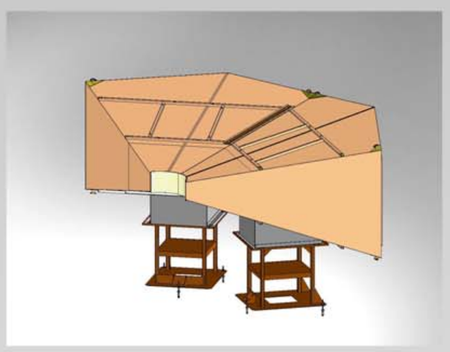
IN5 is a general purpose **direct geometry Time of Flight** (ToF) spectrometer. It is used to study low-energy transfer processes as a function of momentum transfer. Typically this instrument is used for measurements in the small energy and momentum transfer region with values of about 1 % for the energy resolution (e.g. quasi-elastic scattering in solids, liquids, molecular crystals and inelastic scattering with small energy transfers in the order of magnitude 0.1 - 250 meV). It offers total flexibility of wavelength selection and chopper speed which permits considerable optimisation of the energy range, energy resolution, momentum-transfer range and countrate. The chopper system provides an extremely well defined resolution function which remains nearly gaussian (counter-rotating disks) down to 1/2000 of its height.

The **secondary spectrometer** begins with an evacuated sample box. This allow to remove the external wall of a cryostat or of an oven, or to use the cryoloop in vacuum. The precise vertical positioning of the sample box is achieved by a computer controled motor allowing to align 3 samples vertically without opening the sample environment. The sample box is equipped with a 5° pitch gadolinium oxide coated 0.8mm steel blades **oscillating radial collimator** which reduces parasitic reflections from the sample environment.

An **argon filled box** between the sample and the detectors minimises the background. 259 detector boxes (852 ^{3}He detectors tubes) are spread over the whole **single detector bank**.

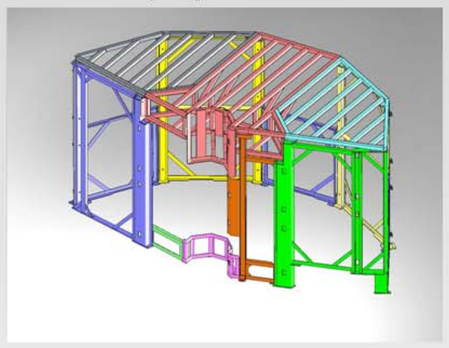
The **small angle area** is covered by a **position sensitive detector** (PSD) 200cm x 100cm divided in 8192 cells of approximately 1inch2 and positioned 4.30m after the sample. The small angle scattering range is analysed by a 3He filled charge division PSD tubes. The flight path at small angle between 2° and 8° is under vacuum between the sample and the PSD. The small angle scattering area needs the use of collimation before the sample (a 60' collimation is available).

Temporary Spectrometer

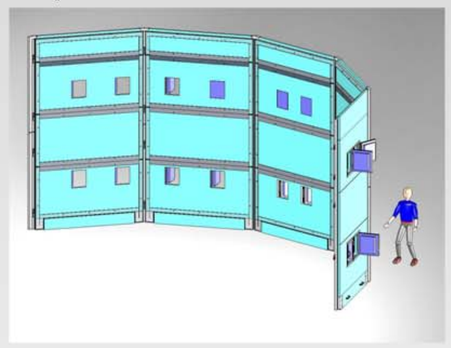


Argon chamber – Aluminium welded skins, windows 0.5mm thick
Ext radius 4m, height 2.1m – aperture angle 120°
Coating : Gadolinium paint ~100µm
Pressure : 20 mbar ΔP

Reused equipments from temp. to final version

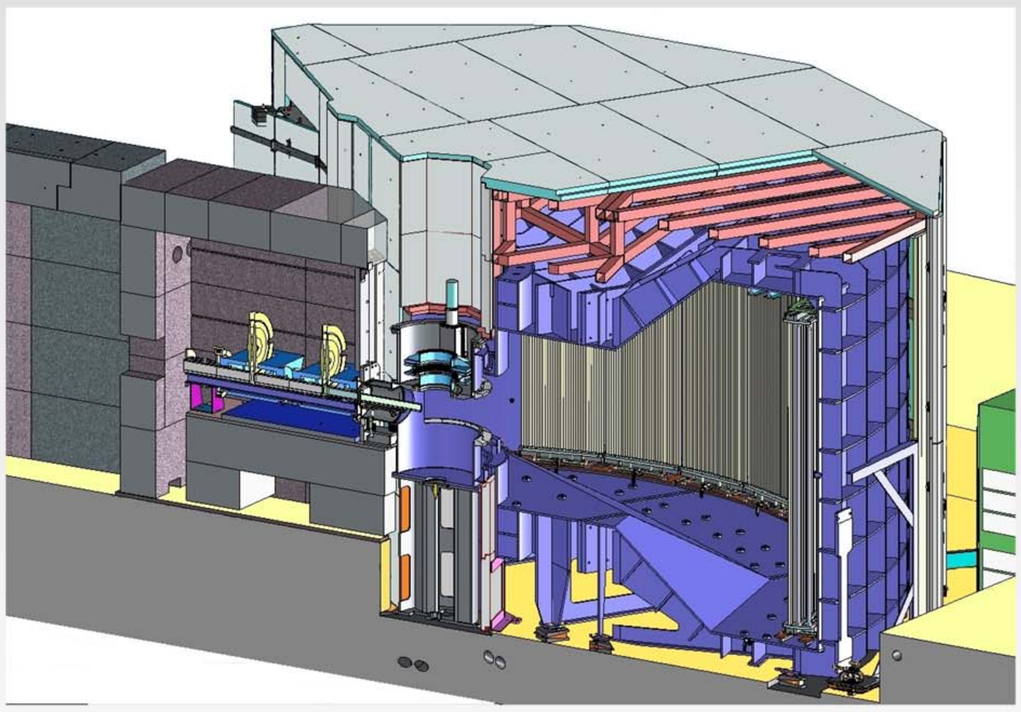


Aluminium welded structure

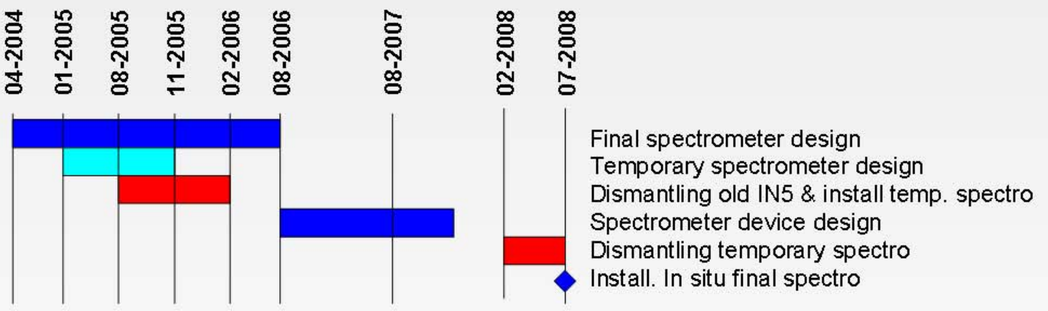


Radioprotection : PEHD + B_4C

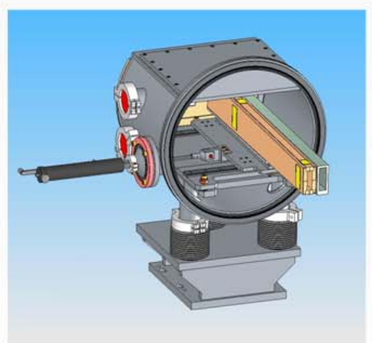
Final Spectrometer



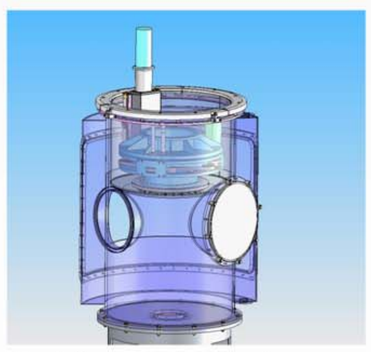
Timescale



Total shutdown = 9 months
Time studies = 3½ years

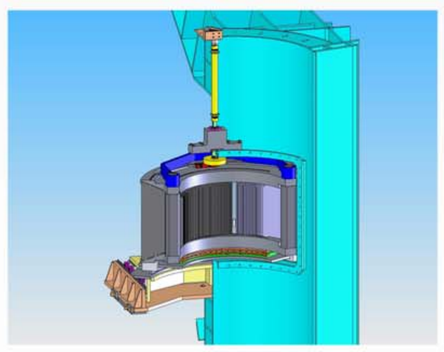


Collimator changer
- S shape Bender
- Honeycomb 5x5
- Focusing guide

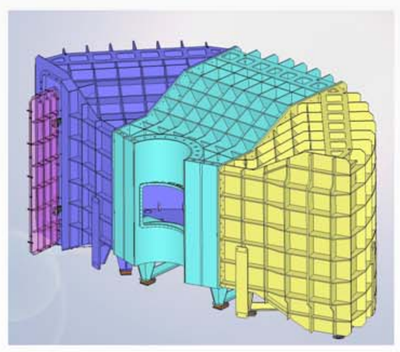


Aluminium sample chamber
- Ø inside :830mm Ht: 1700mm

'Up & Down' device
- Stroke 190mm



Radial collimator
Oscillation 2° / min
Blades : Stainless steel
Coating : Cadmium 50µm



Vacuum chamber – Aluminium welded
Volume 75m^3 - Pressure 10^{-3} mbar
Coating : Cadmium
Weight = 20 tons

November 2007