



Neutron Detector Traverse System

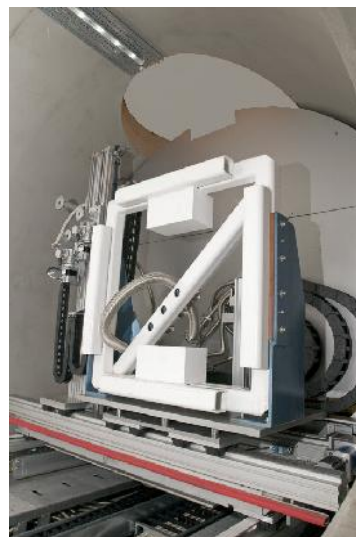
Description

A high accuracy traversing system for a neutron detection system, used to measure the low deflection angles of neutrons as they pass through a sample material, in order to establish its structure on distance scale of 1 - 1000 nm.

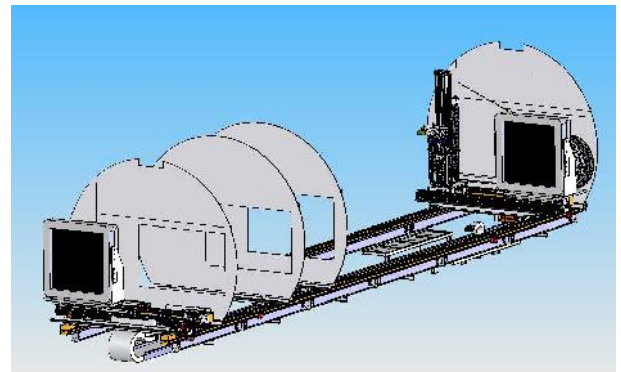
The system positions two 440 kg, high complexity, neutron detectors to an accuracy of 0.5 mm in a 4 m diameter, 13 m long vacuum chamber, operating at 0.01 mbar.

This required the design of a 14 axis, high stiffness structure 2 x 9.85 m axial axes, 2 x 1.7 m transverse axes and 1 rotary axis for the neutron detectors; 4 axial axes for the neutron baffle systems and an additional 5 axes for neutron beam stopping devices.

To ensure acceptable overall stiffness for the high accuracy required, the design of the structure was optimised using a finite element model. The motion control system utilised was a Galil system, driving high stiffness, electro-mechanical actuators (via NEMA34 stepper motors), with incremental encoder feedback on each axis. All cables, switches, motors, grease etc were vacuum rated. Maximum axial traversing speed was 100 mm/s and the entire assembly was accurately aligned with the beamline centreline and finally assembled inside the vacuum chamber.



*Inside Vacuum Chamber
with Dummy Detectors
(Photo courtesy of RAL)*



*Cad Model of Traverse System
& Neutron Detectors*



Traverse During Assembly & Testing

Disciplines Used

- Conceptual design
- Mechanical & electro-mechanical design
- Stress & Vibration Analysis
- Project management
- Assembly & commissioning