

References for Complete Neutron Beamline Instruments

MIRROTRON Ltd Company was founded by physicists and engineers of the former Central Research Institute for Physics (KFKI Budapest) in 1991. Its activities are centered on scientific instrumentation, primarily related to neutron scattering. The company has been in good position to take advantage of Hungary's rapid move to market economy and to draw on the experience as well as the achievements of the Hungarian school of neutron scattering. A good example is the installation of a new cold source and supermirror neutron guide system as well as a set of neutron beam experimental stations at the 10 MW Budapest Research Reactor (BRR) in the past few years.

Together with the K.J. Lesker Co. (USA) a dual target magnetron sputtering system for large scale production of supermirror or other multilayer devices - as a major application - for neutron scattering research was installed at the Budapest plant in 1995/96. MIRROTRON has installed also - in collaboration with the Budapest Neutron Centre - a neutron reflectometer (co-financed by MIRROTRON) on a neutron guide at BRR in order to improve its quality control capacities and insure the direct neutron beam testing of its multilayer products.

At the moment, MIRROTRON is working with 30 full time employees and regularly helped by about the same number of scientific expert consultants (by case by case contracts). MR's personnel and associated partners have long experience in instrument development, since the Company was formed by those scientists at the Budapest Research Reactor (BRR) who had been involved in many important neutron instrumentation projects in Europe. Some of the Company's leading persons spent several years at various outstanding laboratories such as ILL Grenoble, HMI Berlin, LLB Saclay or FLNP Dubna. The successful reactor and neutron scattering instrumentation upgrading at BRR has been also partly lead by this team. MIRROTRON's scientists have had a dominant involvement in instrument construction for about 16-20 neutron scattering spectrometers at 6 different European laboratories. Concerning neutron guides, MR has delivered neutron optical components or entire guide systems to the following laboratories:

ANSTO - Australian Nuclear Science and Technology Organisation; SNS - Oak Ridge, US; Berlin Neutron Scattering Center; Budapest Neutron Centre; Frank Laboratory of Neutron Physics, Dubna; ISIS T2 Rutherford Appleton Laboratory; Institut Laue Langevin, Grenoble; Laboratoire Léon Brillouin, Saclay; Los Alamos National Laboratory; Argonne National Laboratory; JAEA Japan; CARR Beijing; INPC Mianyang.

Complete Neutron Beamline Instruments and Components

In years 1998 – 2011 Mirrotron received awards for several large contracts for delivery of instruments or entire guide systems (these contracts have only a partial overlap and a suitable sequence with the current task/proposal), thus the company's capacity has been considerably extended.

For reference examples, the following are listed below:

- **HMI EXED Guide and Exchange Collimator**

Contact Person: Dr. Judith Peters

Year of order: 2005

Delivered in: 2006

Components:

- Elliptical Neutron guides
- Exchange collimator system (3m long)

Note: The complete instrument is successfully installed and commissioned.



- **ANSTO Quokka Exchange Collimation Chambers**

Contact Person: Dr. Elliot Gilbert

Year of order: 2006

Delivered: 2007

Components:

- Exchange Collimation System (20m long)
- Laser Alignment System
- Neutron guides
- High-precision Motorized Positioning system
- Guide Field Magnet System integrated
- RF Flipper built-in
- Lens and Prisms Holder
- Rotating Aperture Changer System
- Telescopic Nozzle

Note: The complete instrument is successfully installed and commissioned.



- **SNS FnpB Neutron Guide and Chopper System**

Contact Person: Dr. Geoffrey Greene

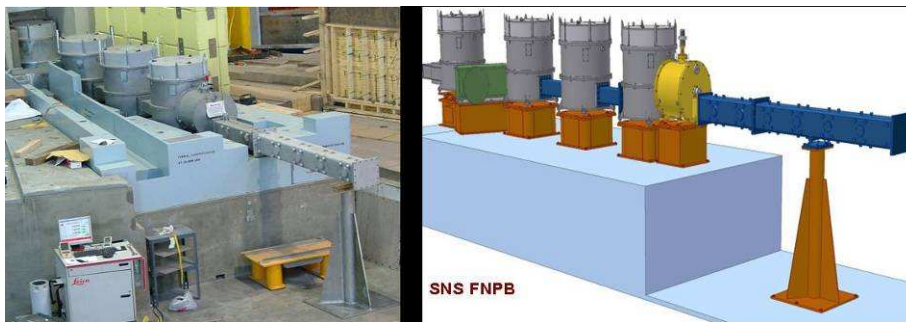
Year of order: 2006

Delivered: 2008

Components:

- Metal-glass Neutron guides (30m long, with in-pile and bender sections)
- Chopper Vacuum box (qty 3)
- Neutron Disk Chopper (qty 3)
- Monochromator Vacuum Chamber
- Vertical Rotating Secondary Shutter

Note: The complete instrument is successfully installed and commissioned.



- **INPC SANS – Small Angle Neutron Scattering Spectrometer**

Contact Person: Prof. Chen Bo

Year of order: 2006

Delivered: 2008

Components: TURN-KEY INSTRUMENT

- Exchange Collimation Chamber (15m long)
- Diaphragm Changer (qty 3)
- Laser Alignment System
- Multi-Beam Collimation guides
- High-precision Pneumatic Positioning system
- Nozzle with Gate valve and Vacuum System
- Neutron Guides
- Neutron Velocity Selector
- Neutron Beam Monitor
- Secondary beam shutter
- Sample Changer with Vacuum/Heat/Cooling options
- Detector Tank (15m long with Detector Positioning Rail System)
- 2D PS Large Area Detector (640 x 640mm)
- Complete Control System with Operation Software
- Complete Shielding design

Note: The complete system is under installation.



- **HMI VSANS Exchange Collimation System with Neutron Guides**

Contact Person: Dr. Daniel Clemens

Year of order: 2007

Delivered: 2009

Components:

- Exchange Collimation Chamber (12.5m long)
- Diaphragm Changer (qty 2)
- High-precision Motorized Positioning system
- Nose with Aperture changer
- Nozzle with Gate valve
- Neutron Guides
- Multi-pin Collimation System (30 units of 4-axis positioning system)

Note: The complete instrument is successfully installed and commissioned.



- **SNS HYSPEC Complete Instrument with neutron guides and beamline components**

Contact Person: Dr. Mark Hagen

Year of order: 2008

Delivered: 2009-2010

Components:

- Gapless Metal-glass Neutron guides (35m long, with 2 in-pile sections)
- Chopper Vacuum box (qty 2) and Fermi Chopper Vacuum Box
- Neutron Disk Chopper (qty 2)
- Neutron Fermi Chopper (250 Hz)
- Beam Monitor Vacuum Box
- Integrated Gate Valve
- Horizontal Rotating Secondary Shutter

Note: The complete instrument is successfully installed and commissioned.



- **CIAE/ICCAS SANS Collimation System and Velocity Selector**

Contact Person: Prof. Charles Han

Year of order: 2008

Delivered: 2009

Components:

- Exchange Collimation Chamber (12,5m long)
- Diaphragm Changer (qty 4)
- Laser Alignment System
- Multi-Beam Collimation guides
- High-precision Positioning system
- Gate valve
- Neutron Guides
- Neutron Velocity Selector
- Pre-and Post Selector Neutron guides
- Secondary beam shutter with Beam Stop
- Neutron Beam Monitor
- Vacuum System
- Complete Control System with Operation Software
- Complete Shielding design

Note: The complete instrument is successfully installed.



- **INPC TPNR - Time-of-Flight Polarizing Neutron Reflectometer**

Contact Person: Prof. Chen Bo

Year of order: 2007

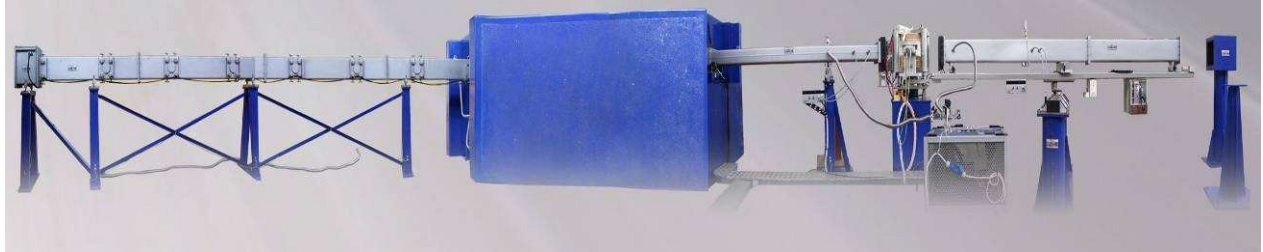
Delivered: 2010

Components: TURN-KEY INSTRUMENT

- Secondary beam shutter
- Disk Chopper System (qty 4)
- Shielding bunker for choppers
- Neutron guides (7m)
- Beam Shaping Slit System (qty 4)
- High-precision Sample Positioning system
- Magnetic Field option for Sample (1.2T)
- Analyzer / Polarizer with RF Flippers
- RF Current Source
- Detector Positioning Rail System
- 2D PS Detector (200 x 200 mm) with ListTDC electronics
- Neutron Beam Monitor with ListMod electronics
- Complete Control System with operating software
- Data Acquisition and Evacuation Software
- Complete Vacuum System



- Complete Shielding design
Note: The complete instrument is successfully installed.



- **INPC RSND – Residual Stress Neutron Diffractometer**



Contact Person: Prof. Chen Bo

Year of order: 2008

Delivered: expected in 2011

Components: **TURN-KEY INSTRUMENT**

- Additional Primary beam shutter
- Neutron guides – 5m
- Double focusing Si monochromator unit
- Monochromator goniometric stage
- Monochromator rotating shielding
- Secondary beam shutter
- Neutron Beam Monitor with ListMod electronics
- Beam definition assembly
- Beam Shaping double slit system with Optical Adjusting System (qty 2)
- High-precision Sample Positioning system– for 500kg
- Monochromatic beam stop
- Oscillating radial collimator
- Detector stage with shielding
- 2D PS Detector (200 x 200 mm) with ListTDC electronics
- Complete Control System with operation software
- User software
- Vacuum System
- Complete Shielding design

Note: The complete system is delivered and under installation.

