

References for Neutron Polarization Devices

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. The first supermirrors were produced and tested at KFKI by *F. Mezei* in 1974.

Together with the K.J. Lesker Co. (USA) two dual target magnetron sputtering system designed and built for small scale production (total area 0,2m²) of supermirror or other multilayer devices - as a major application - for neutron scattering research was installed at the Budapest plant in 1995/96.

Based on the experience from the existing sputtering machine MIRROTRON completely designed, built and installed the 1st large scale sputtering machine (total area 1,2m²) at year 2000.

For response to the increased demand for supermirror (Ni/Ti and NiMo/Ti) and polarizing multilayer coating (Fe/Si) and to reduce the production delivery leadtime new investment decided for the 2nd large scale sputtering machine (total area 1,2m²). It is completely re-designed (3D) and built by MIRROTRON based on the most up-to-date knowledge on supermirror coating. Current status: under assembly at MIRROTRON's site and the production is scheduled to the end of 2011.

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).

Title:	Nr.	Qualification profile:
- Manager:	5 person	engineers
- Scientist:	1 person	PhD
- Mechanical Designer:	10 person	mechanical engineers
- Electrical Designer:	2 person	electrical engineers
- Technician:	12 person	technician

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; Instiut Laue Langevin, Grenoble; Laboratoire Léon Brillouin, Saclay; Los Alamos National Laboratory; Argonne National Laboratory; JAEA Japan; CARR Beijing; INPC Mianyang.

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In years 2000 - 2011 Mirrotron received awards for several large contracts for delivery of entire polarization devices or complete polarization 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 finished projects are listed below:

- **LANL - Polarization Cavity**

Year of award: 2001

Contact Person: Dr. Michael Fitzsimmons

The device is delivered and commissioned.



- **ANSTO – QUOKKA Guide Field Magnet System and Polarization Cavity**
Including RF flipper

Year of Award: 2007

Contact Person: Dr. Elliot Gilbert

The complete system is installed and commissioned.



- **ILL – IN15 Polarization Cavity**

Year of Award: 2007

Contact Person: Dr. Bela Farago

The device is delivered and commissioned.



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

Contact Person: Prof. Chen Bo

Year of order: 2007

Complete turn-key Instrument including:

- High-precision Sample Positioning system
- Magnetic Field option for Sample (1.2T)
- Analyzer / Polarizer with RF Flippers
- RF current sources

The Factory Acceptance Test is successfully completed and instrument is delivered.



- **ANSTO – Platypus Complete Polarization System**

Including RF flippers/Analyser/polarizer/guide field/RF current source

Year of Award: 2008

Contact Person: Dr. Frank Klose

The complete system is installed and commissioned.



- **HZB BioRef Neutron guides (5m) and frame-overlap-mirror**

Year of Award: 2008

Contact Person: Dr. Marcus Strobl

The complete system is installed and commissioned.



- **ANSTO – Pelican Supermirror Polarizer System**

Including RF flipper

Year of Award: 2008

Contact Person: Dr. Dehong Yu

The complete system is delivered.

