



ESS Neutron Chopper Jamboree,
13-14 of November 2014 in Lund, Sweden

www.mirrotron.hu



MIRROTRON LTD

About us

BNC
Budapest Neutron Centre



www.mirrotron.hu

Activity

R&D and Supply of Neutron Optic Instrumentation for Neutron Scattering Experiments

- **Provide full Services:**
 - Analysis – Simulation - Calculation
 - Custom Design
 - Production /ISO 9001 & SAP/
 - Installation, Commissioning
 - After Sales Services



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JAEA 独立行政法人
日本原子力研究開発機構
Japan Atomic Energy Agency

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Products for Neutron Scattering

- **Neutron guides:** supermirror Ni(Mo)/Ti multilayers for guides, support structures & vacuum housing systems;
- **Polarizing Systems:** polarizing Fe/Si supermirrors; S-Benders, polarizer-analyzer systems;
- **Components** for neutron beam experiments - collimators, magnets, **choppers**, velocity selectors, beam shaping devices, slits etc.
- Design and manufacturing of neutron guide static and radiation **shieldings**;
- **Detectors:** beam monitors, He-3 2D position sensitive multi-wire proportional counters;
- Complete Neutron **Spectrometers:** design, construction and installation and validation by neutrons.

Neutron Optic Instruments



Neutron Beamline Components – Disc Choppers

Disc Choppers



Design & Calculation
Fabrication & Coating
Neutron Transmission Test
Validation Tests
Installation

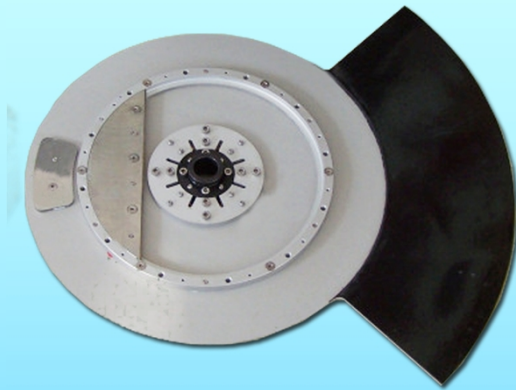
Fermi Choppers



Neutron Optic Instruments



Neutron Beamline Components – Disc Choppers

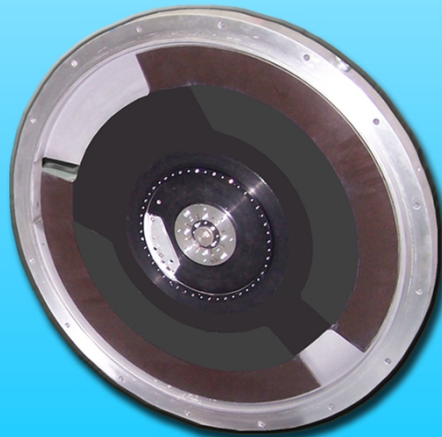


Disc base material:

Carbon-fiber or Aluminum

Neutron absorbing
material:

Boron 10 or Gadolinium



Disc type:

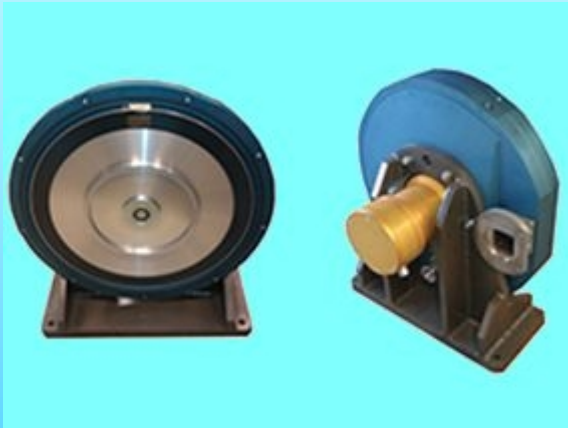
BWL/Correlation/Furier/Beam
symmetric/asymmetric/extreme cut-out



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Neutron Beamline Components – Disc Choppers



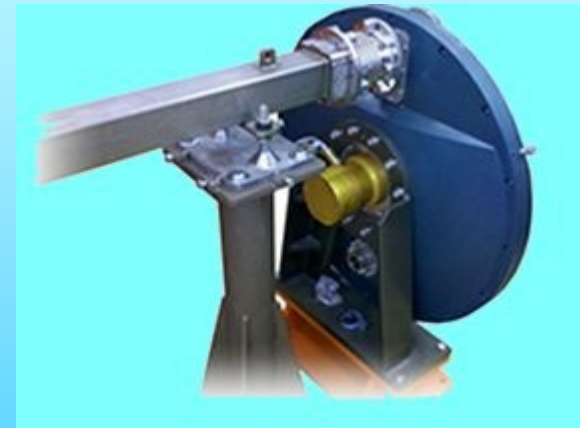
Disc size:

300mm to 700mm

Speed:

Low-Intermediate-High

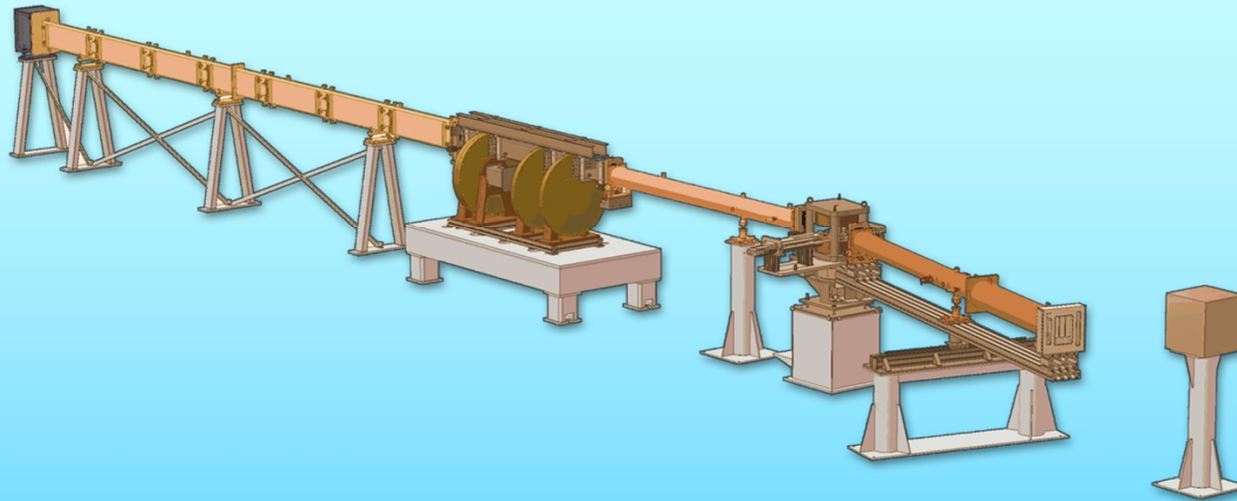
7Hz – 196Hz – 250Hz



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Neutron Beamline Instruments

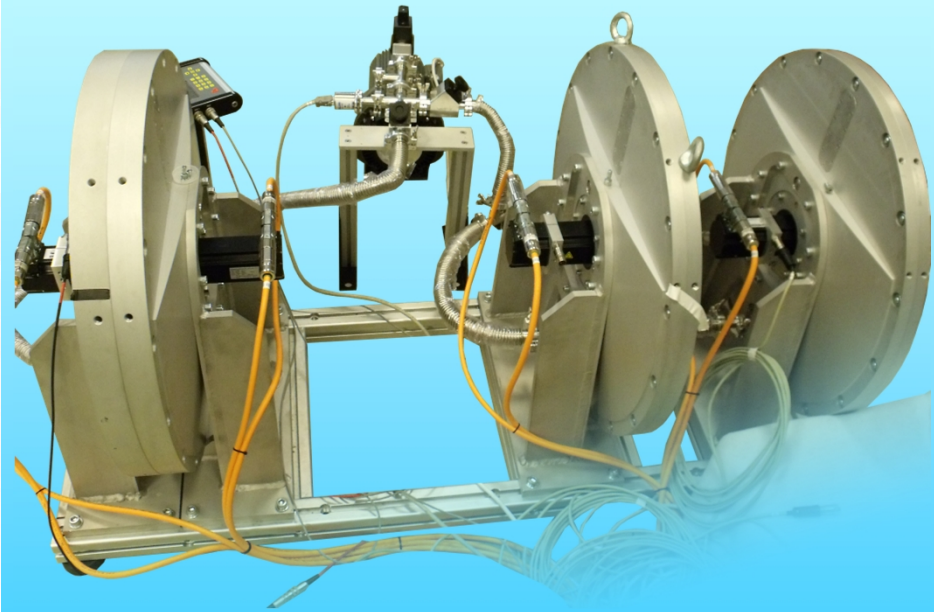


TIME-OF-FLIGHT CHOPPER SPECTROMETER DESIGN & INSTALLATION & COMMISSIONING

Neutron Optic Instruments



Neutron Beamline Components - Disc Chopper System



Servo Drive System

Speed up to 130Hz

Recommended for low and intermediate speed disc choppers

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Neutron Beamline Components – Servo Drive System

Application:

Low & Intermediate Speed

Low Budget

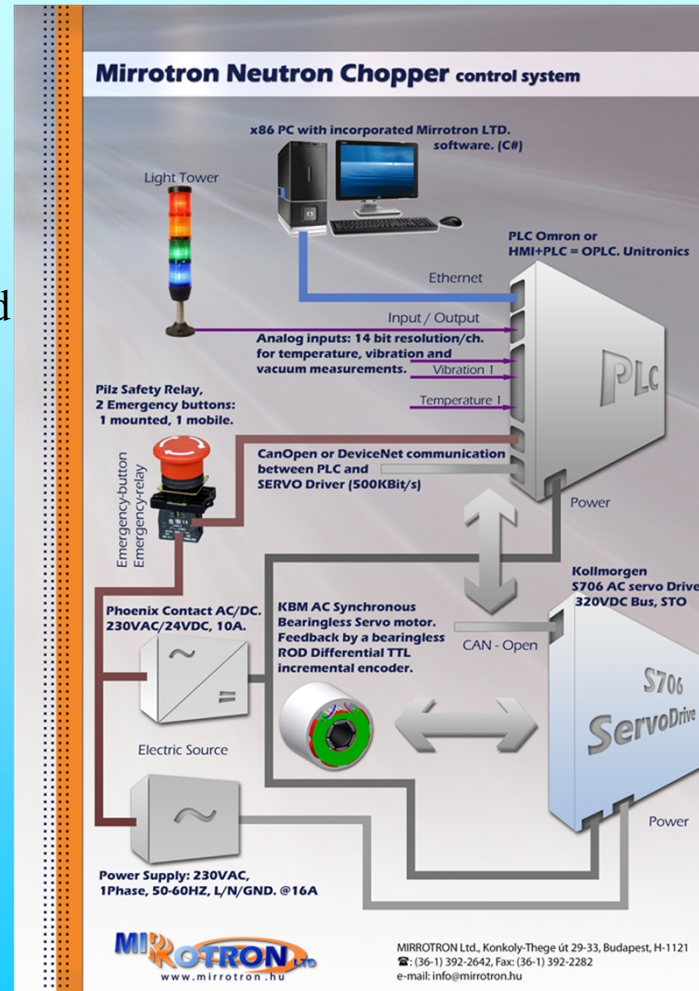
Features:

PLC – EPIC

Bearingless Servo Motor

Commercial Components

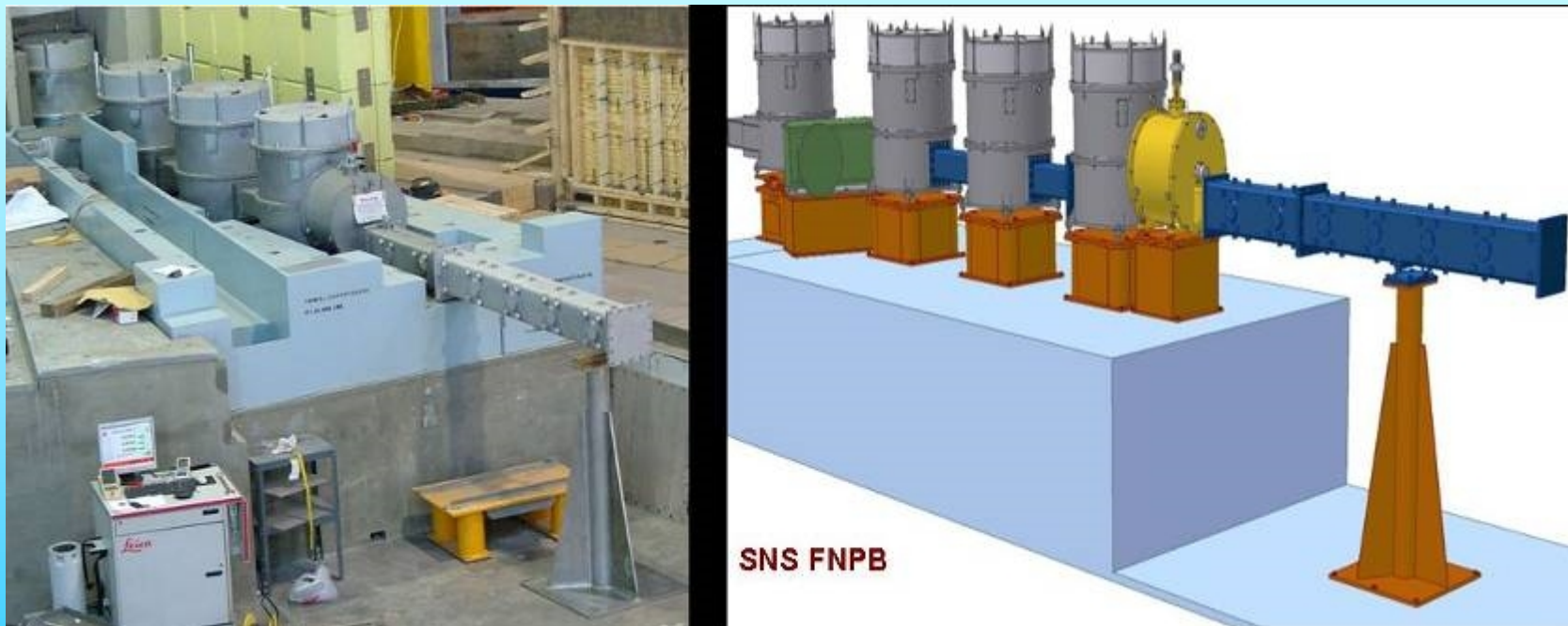
Low Cost



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Integrated Neutron Beamline Components



Magnetic Bearing Levitated Disc Chopper (4pcs) Guide (20m) Vacuum and Shutter System for SNS

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Integrated Neutron Beamline Components – Guide & Chopper System



Magnetic Bearing Levitated Disc Chopper (2pcs – 60Hz) and Fermi Chopper (350Hz) and Guide (30m) Vacuum and Shutter System for SNS – HYSPEC Beam line

Neutron Optic Instruments

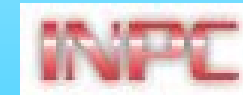


Neutron Beamline Components – Neutron Disc Choppers

Produced & Installed: 47 discs



47 pcs Neutron Disk Chopper
11 pcs Servo Drive System
36 pcs Magnetic Bearing Levitated



Speed:

High: 250Hz: 3 discs
Intermediate: 150Hz: 3 discs
120Hz: 6 discs
100Hz: 4 discs
Low: 60Hz: 22 discs
50Hz: 7 discs
25Hz: 2 discs

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Neutron Beamline Components – Neutron Fermi Choppers



Vertical Translation for dual slit package/empty beam

Magnetic Bearing Levitated Rotor Assembly

Remote Control

Air/Water Cooling System

Custom Designed into Beam Environment

Speed up to 36,000RPM – 600Hz

Neutron Optic Instruments



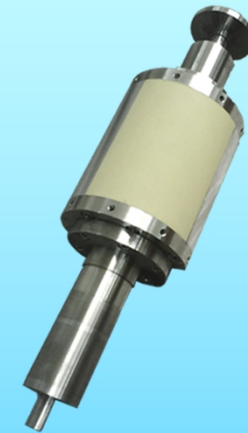
Neutron Beamline Components – Neutron Fermi Choppers



Design considerations:

1 - SAFETY

Light Weight Fermi chopper payloads:
Payload Assembly Mass: 6-8 kg
Complete Design Calculation – FEA



2 - USAGE

Fermi location in the beam line



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Neutron Beamline Components – Neutron Fermi Choppers



Slit package design:

- dual/single
- bent/straight

Slit package substrates:

- Gd foils
- Al sheets
- Si wafers

Slit package coatings:

- enriched B10 metal
- pure Gd metal
- Supermirror



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Neutron Beamline Components – Neutron Fermi Choppers



Produced & Installed: 11 unit
High Speed Fermi Choppers



EXED Dual – 600Hz



CNCS – 300Hz x 2
HYSPEC – 480 & 540Hz



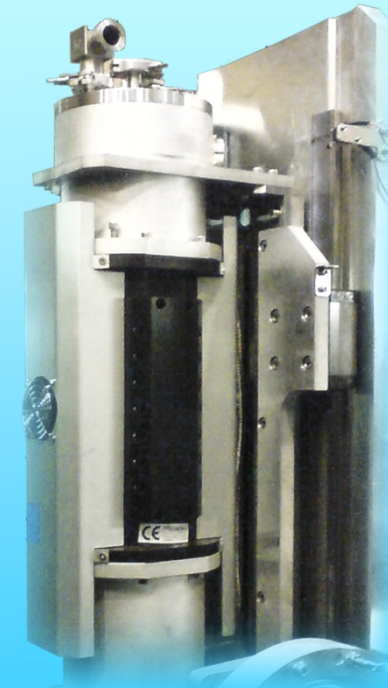
PELICAN – 400Hz x 3



FCS Dual – 500Hz



4 SEASON – 600Hz x 2



All Fermi choppers delivered by Mirrotron driven by
SKF Magnetic Bearing and Control System

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Neutron Beamline Components – Chopper Developments

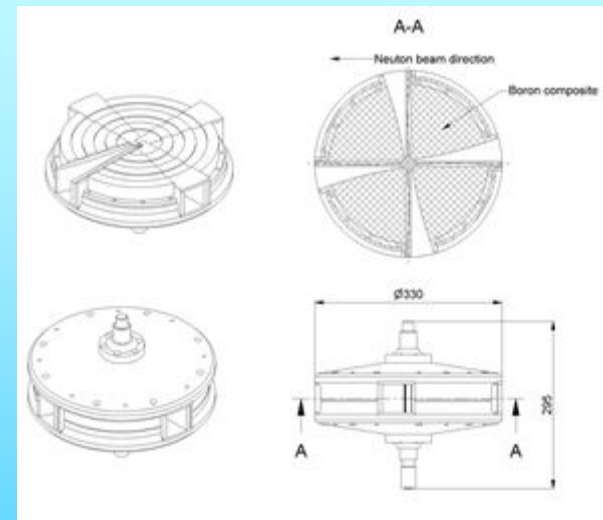
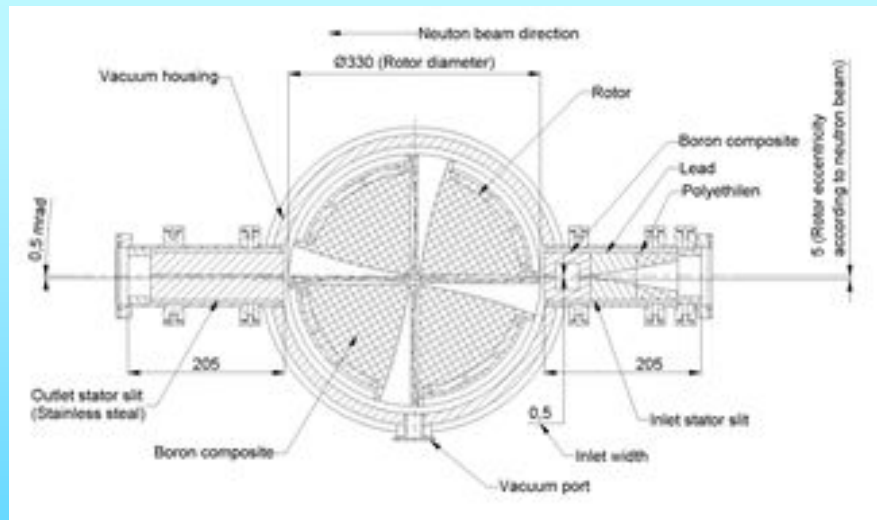
ABS – Automatic Balance System
for
Magnetic Bearings

High-B10 content thin coating

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Neutron Beamline Components – Chopper Developments



Fermi Disk Neutron Chopper
Microsecond chopper for use in separating
neutrons of various speeds

Thank you for your
attention!