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The Svedberg Laboratory: the accelerator and the neutron beam facility

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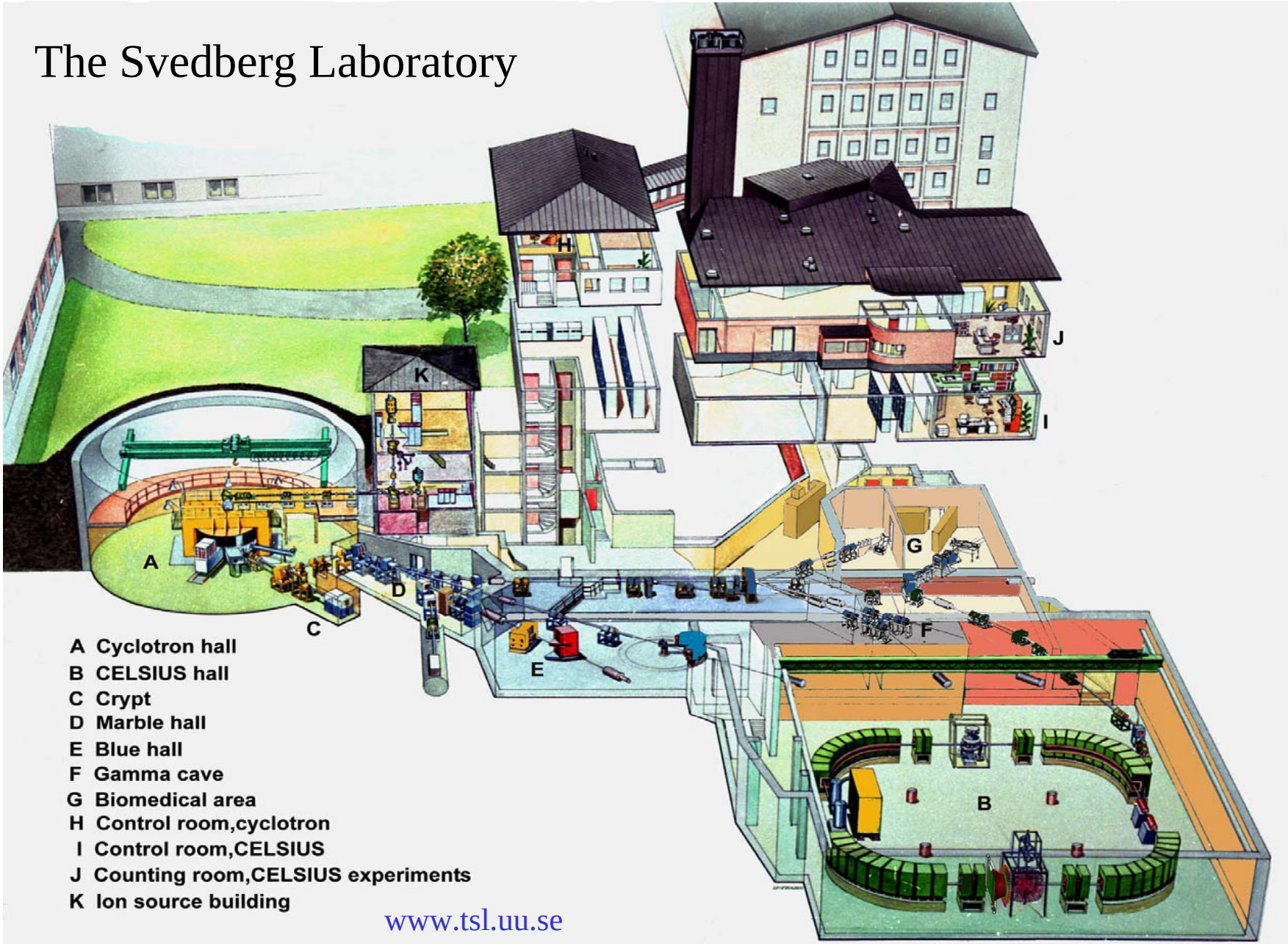
The Svedberg Laboratory



A Cyclotron hall
B CELSIUS hall
C Crypt
D Marble hall
E Blue hall
F Gamma cave
G Biomedical area
H Control room,cyclotron
I Control room,CELSIUS
J Counting room,CELSIUS experiments
K Ion source building

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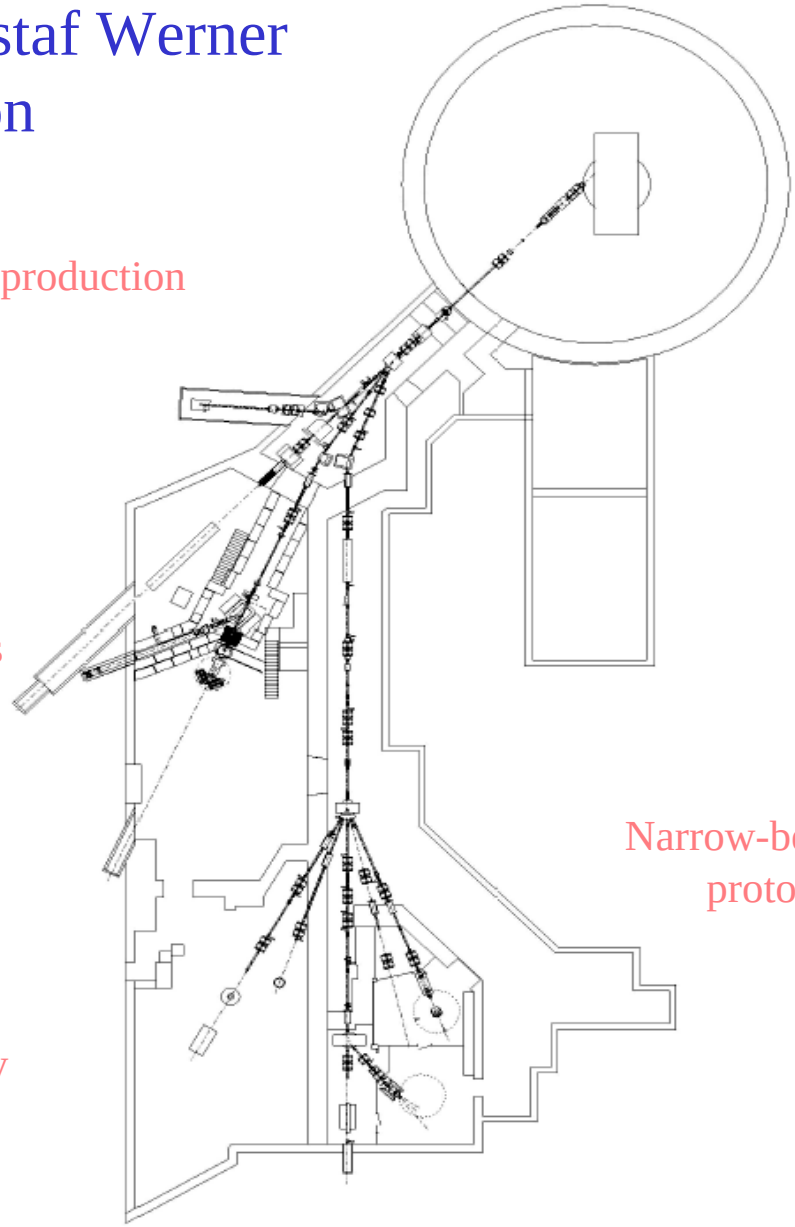
The Gustaf Werner cyclotron

Radionuclide production facility

Proton and neutron irradiation facilities



Narrow-beam and broad-beam proton treatment facilities

Heavy-ion beam irradiation facility

Light-ion beam irradiation facility

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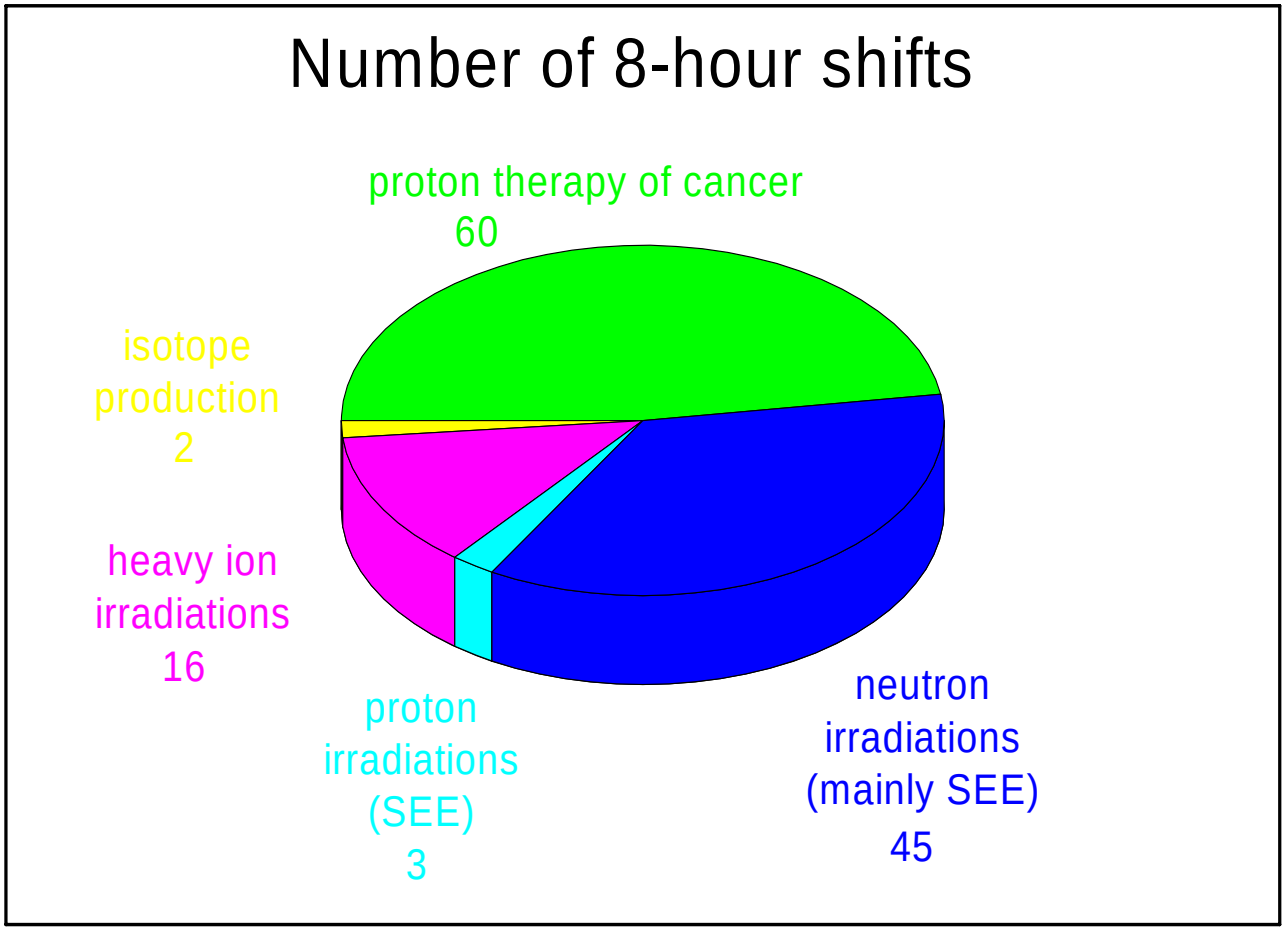
Distribution of beamtime (August-December 2005, preliminary)



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Proton-treatment facility

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Prostate cancer treatment

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Available ion beams

Ion	Energy per nucleon (MeV/u)		Beam intensity (particle nA)	
	the lowest	the highest	for the lowest energy	for the highest energy
^{11}B	4.71	40.0	13	0.25
^{12}C	4.71	45.1	1000	1.0
^{14}N	4.71	45.1	1100	0.07
^{16}O	4.71	45.1	670	0.06
^{20}Ne	4.71	45.1	560	0.10
^{28}Si	4.70	19.6	140	3.0
^{40}Ar	4.70	17.5	75	31
^{84}Kr	4.70	11.2	12	2.5
^{129}Xe	4.70	9.30	2.0	1.0

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Neutron facility: Motivation

- Capability for accelerated neutron testing in compliance with JEDEC JESD89 test specification
- User-friendliness, including:
  - user control of the neutron flux
  - flexible size and shape of the neutron beam
  - spacious and easily accessible irradiation area
  - neutron monitoring service
  - no restrictions/clearance for visitors
  - fast and effective logistics

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Neutron facility: Technical specifications

- Neutron spectrum type: quasi-monoenergetic
- Neutron production method: ^{7}Li(p,n) nuclear reaction
- Peak neutron energy: can be chosen in the interval
  20-180 MeV
- Peak neutron flux: (1-5)*10^{5} neutron/cm^{2}/s fcn. of energy
- Diameter of the neutron beam spot: 1-30 cm at the reference position, up to 1 m at a larger distance
- Beam spot uniformity: 0.5%
- Area-integrated peak neutron beam intensity: to 3*10^{8} /s
- User control of the neutron flux: on/off any time, decrease upon request by any factor up to 1000
- Area available for users at beam line:
  15 m long, 3 m wide

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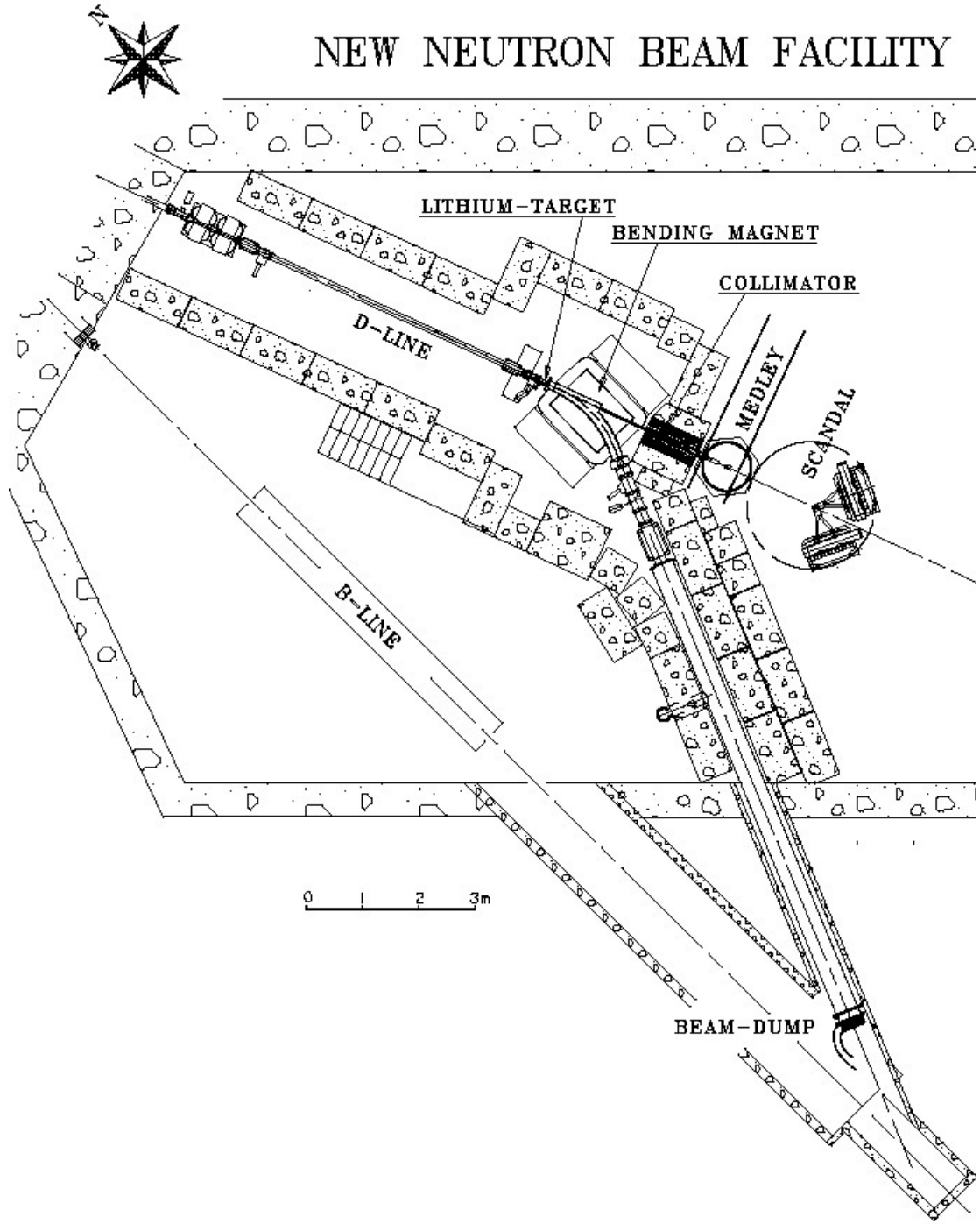
Neutron facility: Top view



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Neutron production target station

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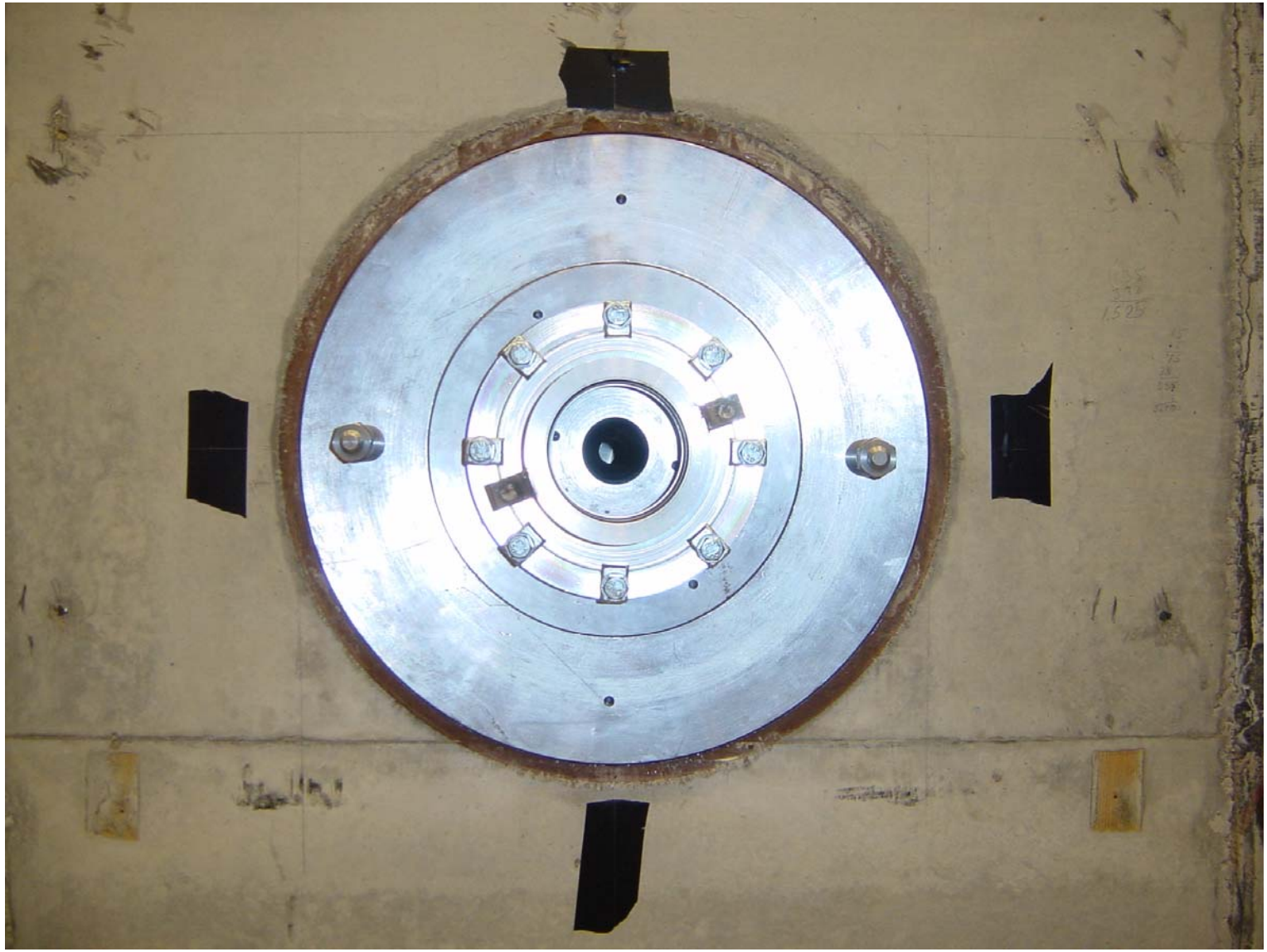
Exit of the neutron collimator



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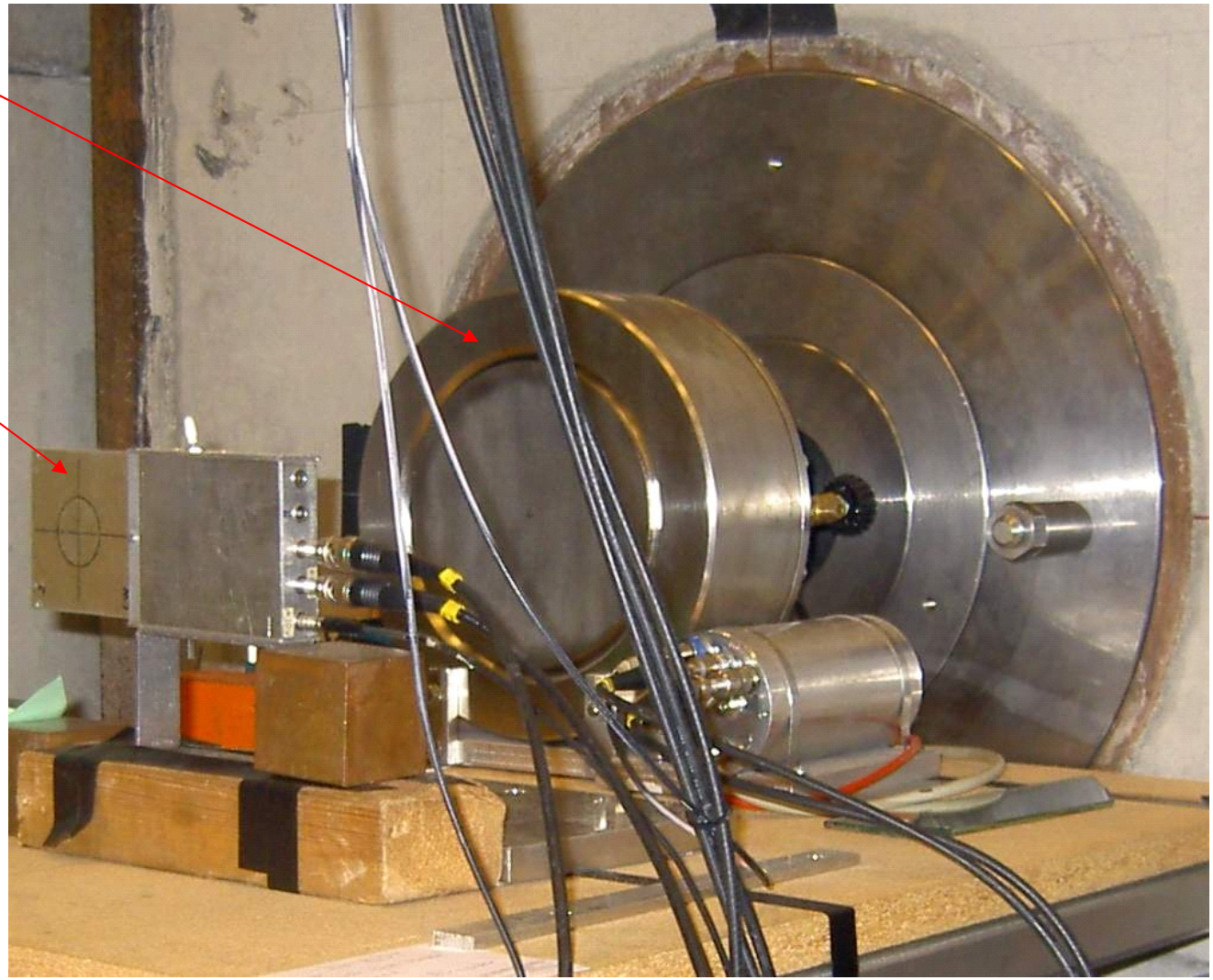
Neutron monitors

(1) Ionization chamber

(2) Thin-film breakdown counter

(3) Proton beam current

Monitors (1) and (2) are based on the fission of ^{238}U.



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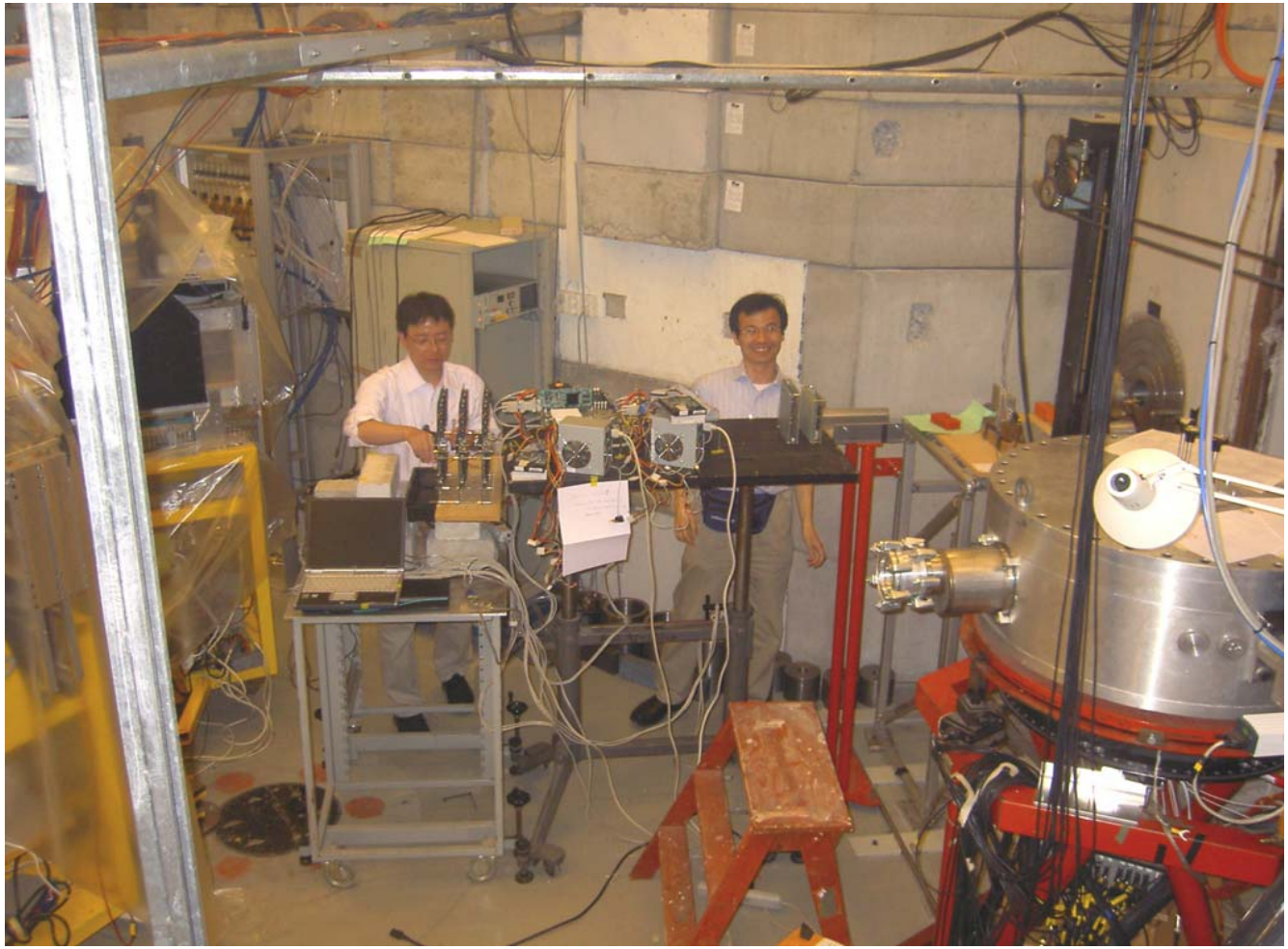
View of the user area

A team from Hitachi, Ltd. is installing devices under test.



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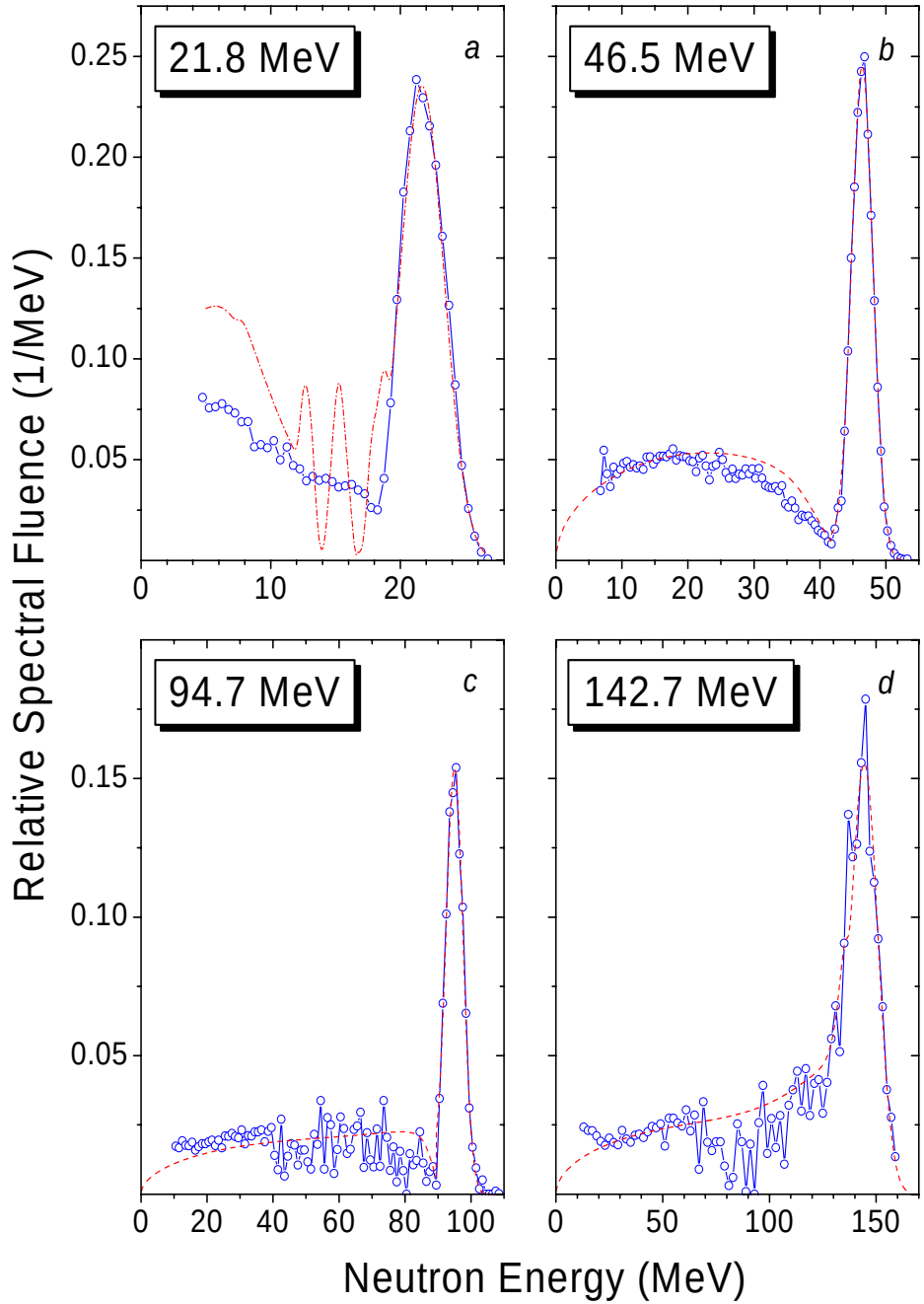
Neutron facility spectra

Neutron spectra at 0º for different peak neutron energies. Symbols connected by a solid line represent experimental data. Model calculations are shown as dashed lines.



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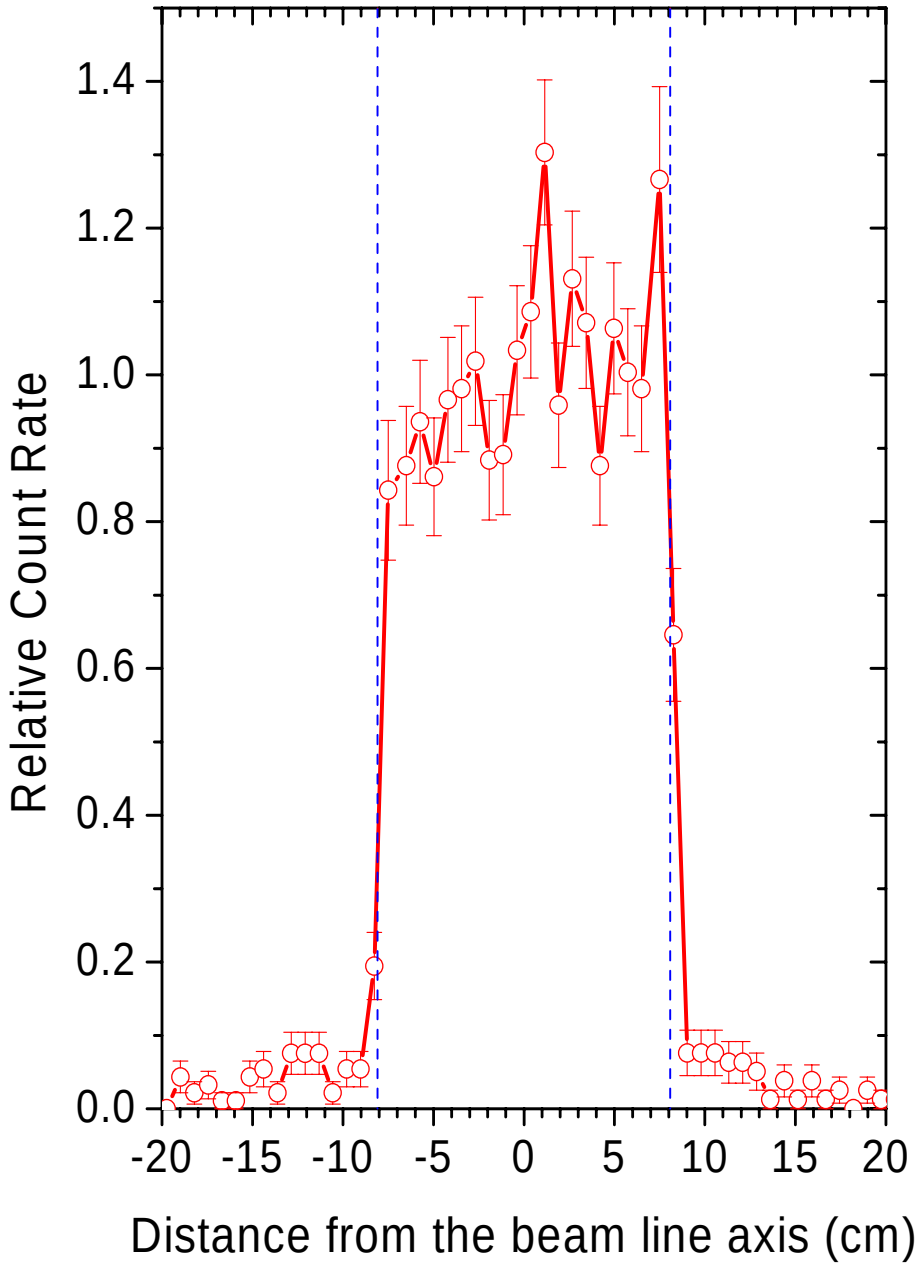
Neutron beam profile

Horizontal beam profile for 142.7-MeV neutrons, measured at a distance of 4.77 m from the production target. Vertical dashed lines represent boundaries of the beam expected from the geometry of the collimator.



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Pricing Policy

- 400 Euro/hour are charged for:
  - User's time
  - Trimming time up to 4 hours/energy/particle type
- 20% discount for irradiation campaigns of 1 week or longer
- No minimum irradiation time
- No cost for set-up time at the irradiation area and at the counting rooms

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Scheduling Policy

Deadline for beam-time requests	**Scheduling Period**
January 15	April – June
April 15	August – October
July 15	November - December
October 15	January - March

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Contact information

Information on TSL: http://www.tsl.uu.se.

Beam-time request: http://www.tsl.uu.se/tsl_beamtime.html

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