

## Upgrading of the reactor BER II

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The Berlin Research Reactor BER II at the Hahn-Meitner Institut is a swimming pool reactor. The BER II was operated at a power of 5 MW from December 1973 until it was shut down in August 1985 for a general physical and technical improvement and upgrading.

The neutron fluxes available at the beam tube positions in the reflector will be about  $10^{14}$  n/cm<sup>2</sup>sec. The upgraded BER II will be a medium-flux neutron source for standard applications, such as neutron scattering, materials research, and activation analysis, the latter of which is used mainly for medical problems.

The increase of the usable reflector-flux density by a factor of 10 is the result of the following:

- The power of the reactor will be increased from 5 to 10 MW.
- The fission density will be increased by reducing the core size from 64 to 42 MTR fuel-element positions.
- The reflection efficiency will be increased by a beryllium reflector. The beryllium reflector, which is 30-cm thick, surrounds the core and produces a well pronounced flux peak about 5 cm from the core edge. To this flux maximum, 10 beam tubes will be adapted (a horizontal cut through the reactor is seen in Fig. 1).

The flux density of cold neutrons will be further increased by a factor of 13 by a cold neutron source. Six neutron guides will feed a new neutron guide hall of approximately 1200 m<sup>2</sup>.

The licensing authorities require backfitting according to current regulations for science and technology for technical improvement. A large number of guidelines and regulations concerning design, construction and operation of nuclear power plants have had to be followed. Thus, planning permission had to cover the energy supply system, cranes, fire protection system, the security system, the reactor control and safety system, and the storage facilities of fresh unirradiated fuel elements as well as spent-fuel elements.

The upgrading program will be completed in 1988 and the operating license is expected in 1989.

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The Hahn-Meitner Institut is one of the 13 national research centers in the Federal Republic of Germany. Basic research in close operation with the Berlin universities is the main task of the Institute. Thus, BER II is an important facility in this program.

The following neutron scattering instruments will be installed in the experimental hall (E) and neutron guide hall (V) respectively (see Fig. 2):

No.	I N S T R U M E N T   A N D   P R O G A M	LOCA- TION
1.	<u>3-Axis-Diffractometer for Polarised Neutrons</u>	E1
2.	<u>Flat-cone Diffractometer and Neutron-Photography</u>	E2
3.	<u>Powder Diffractometer with Multicounter</u>	E3
4.	<u>2-Axis-Diffractometer</u>	E4
5.	<u>Four-Circle-Diffractometer</u>	E5
6.	<u>High Resolution Focussing Single Crystal Diffractometer with Multicounter</u>	E6
7.	<u>3-Axis-Spectrometer</u>	E7
8.	<u>Diffractometer with Multidetector for Biological Membranes</u>	V1
9.	<u>Small Angle Scattering</u>	V4
10.	<u>3-Axis-Spectrometer for Cold Neutrons</u>	V2
11.	<u>Time-of-Flight Spectrometer</u>	V3
12.	<u>Spin-Echo Spectrometer</u>	V5

The upgraded BER II will continue to operate with HEU fuel (93.5 weight percent  $^{235}\text{U}$ ). However, the conversion to LEU fuel (less than 20 weight percent  $^{235}\text{U}$  in total uranium) is planned for the future.

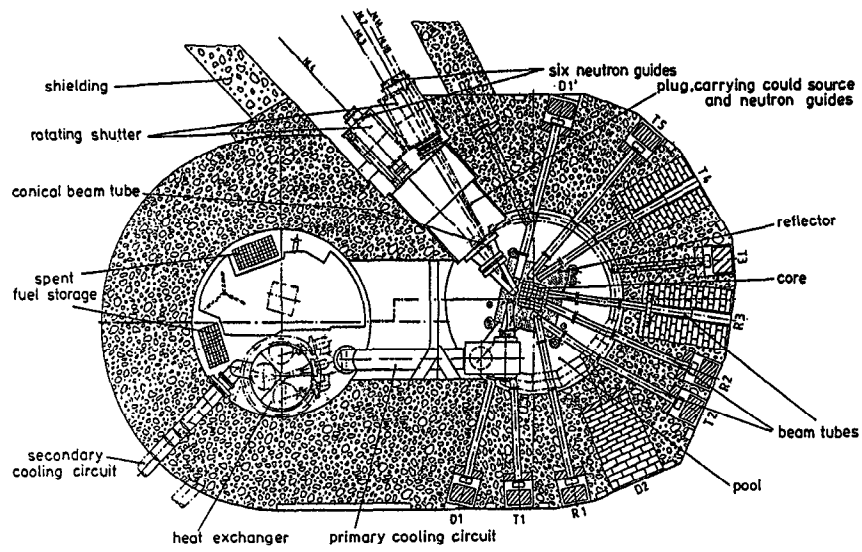


Fig. 1 BER II—horizontal cut.

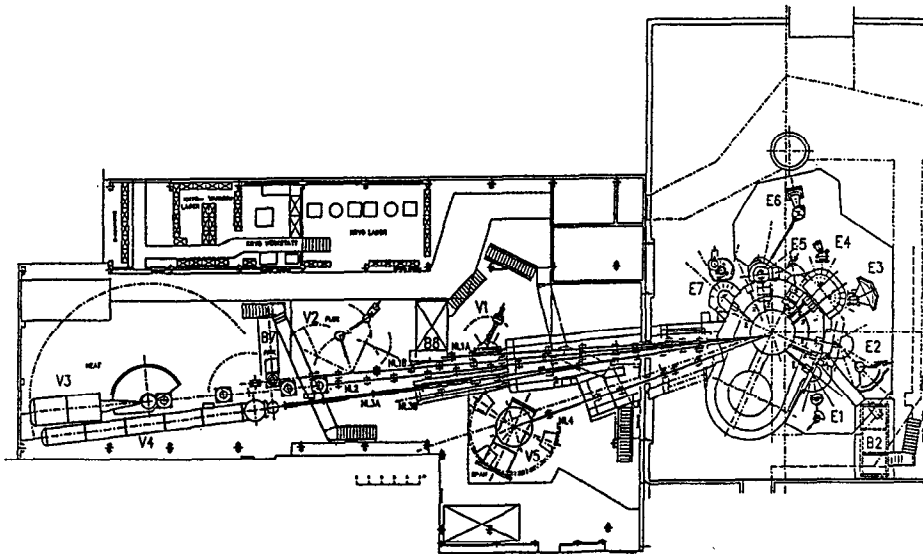


Fig. 2 BER II experimental hall and neutron guide hall.