High Flux Isotope Reactor

Description

The High Flux Isotope Reactor (HFIR) first achieved criticality on August 25, 1965, and achieved full power in August 1966. It is a versatile 85-MW isotope production, research, and test reactor with the capability and facilities for performing a wide variety of irradiation experiments and a world-class neutron scattering science program. HFIR is a beryllium-reflected, light water-cooled and moderated flux-trap type swimming pool reactor that uses highly enriched uranium-235 as fuel. HFIR typically operates seven 23-to-27 day cycles per year. Irradiation facility capabilities include:

- Flux trap positions: Peak thermal flux of $2.5 \times 10^{15} \text{n/cm}^2/\text{s}$ with similar epithermal and fast fluxes (Highest thermal flux available in the western world.)
- Reflector positions: Thermal fluxes of $1.0 \times 10^{15} \text{n/cm}^2/\text{s}$ ranging down to $1.0 \times 10^{14} \text{n/cm}^2/\text{s}$ in the outermost positions
- Two complimentary pneumatic tubes that shuttle samples from the core to the HFIR Neutron Activation Analysis (NAA) Laboratory
  - PT-1: $2.8 \times 10^{14} \text{n/cm}^2/\text{s}$ (Thermal/Epithermal = 40)
  - PT-2: $5.9 \times 10^{13} \text{n/cm}^2/\text{s}$ (Thermal/Epithermal = 200)
- Gamma irradiation Facility maximum does rate: $1.0 \times 10^8 \text{ R/hr}$

Applications

- Thermal and cold neutron scattering science
- Isotope production
  - Californium-252
  - Other transcurium isotopes for R&D
  - Lighter isotopes that require high flux for production
- Fission and fusion reactor materials irradiation studies
- Advanced reactor fuels irradiation studies

Specifications

<table>
<thead>
<tr>
<th>Reactor type</th>
<th>Beryllium reflected, light water cooled and moderated, flux-trap type reactor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel</td>
<td>Highly Enriched Uranium-235</td>
</tr>
<tr>
<td>Thermal neutron scattering instruments</td>
<td>3 horizontal beam tubes serving 7 instruments</td>
</tr>
<tr>
<td>Cold neutron scattering instruments</td>
<td>1 horizontal beam tube serving 5 instruments</td>
</tr>
<tr>
<td>Flux trap region irradiation positions</td>
<td>30 target positions, 6 peripheral target positions, 1 hydraulic rabbit facility position</td>
</tr>
<tr>
<td>Reflector region irradiation positions</td>
<td>42 vertical irradiation positions, 2 slant positions on reflector periphery</td>
</tr>
</tbody>
</table>
| Materials Irradiation Facility | This facility supports instrumented and/or gas cooled experiments
  - 2 flux trap positions ($2.5 \times 10^{15} \text{n/cm}^2/\text{s}$)
  - 8 reflector positions ($1.0 \times 10^{14} \text{n/cm}^2/\text{s}$) |
| Neutron Activation Analysis | 2 pneumatic tubes shuttle samples from the NAA Lab to the reflector region |
| Gamma Irradiation Facility | In spent fuel flux trap |

Date: July 2014