PAUL SCHERRER INSTITUT

CH-5232 Villigen, Switzerland

Large Research Facilities at PSI

The Paul Scherrer Institute (PSI) is a multi-disciplinary research centre for natural sciences and technology. PSI collaborates with national and international universities, other research institutions and industry in the areas of solid state research and material sciences, particle physics, life sciences, energy research and environmental research.

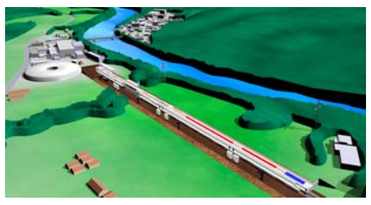
PSI concentrates on basic and applied research, particularly in those fields which are the leading edge of scientific knowledge, but also contribute to the training of the next generation and pave the way to sustainable development of society and economy. The Institute is actively involved in the transfer of new discoveries into industry, and offers, as an international centre of competence, its services to external organisations.

PSI employs 1300 members of staff, making it the largest of the national research institutions – and the only one of its kind within Switzerland. It develops, builds and operates complex large-scale research facilities that impose particularly high requirements in terms of knowledge, experience and professionalism. PSI is one of the world's leading user laboratories for the national and international scientific community.

Facilities

The PSI ring cyclotron

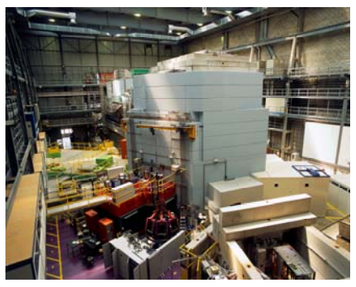
- proton beam with the highest power in the world
- Energy: 590 MeV
- Beam current: 2 mA
- Beam power >1 MW
- Eight sector magnets, total weight of 2000 t
- Four accelerator cavities (50 MHz frequency), peak voltage 730 kV
- Targets for secondary particles (Muons and Pions)



PSI X-FEL Free Electron Laser (in development)

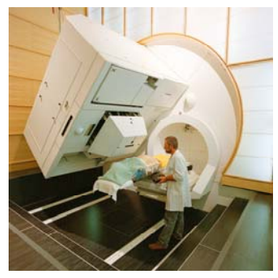
Projected Data:

- Main accelerator Energy: 6 GeV
- X-Ray wavelength: 10 nm to 0.1 nm
- Peak power: 20 GW
- Pulse duration: 30 fs



Spallation Neutron Source SINQ

- continuous source - the first of its kind in the world
- Flux: 10^{14} n/cm^2/s
- proton beam current on spallation target: 1.3 mA
- Beam power: 0.75 MW



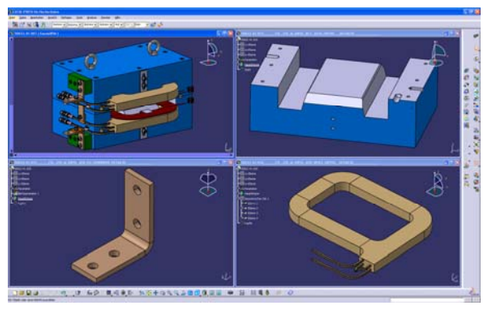
Cancer Therapy

- Unique spot-scanning technique developed at PSI
- 350 cancer patients and
- 5000 eye tumour patients as of August 2008
- Project PROSCAN with a dedicated 250 MeV accelerator and new treatment facilities completed in 2008

Swiss Light Source SLS

- Storage ring energy: 2.4 GeV
- Current: 400 mA
- Orbit stability: less than 1 µm
- Average availability: 97.4% (2007)
- Typical beam lifetime: 7 hours

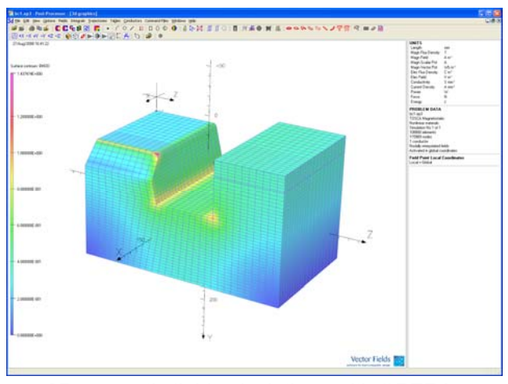
Magnet Section (9 Persons)



3D CAD design and construction in CATIA

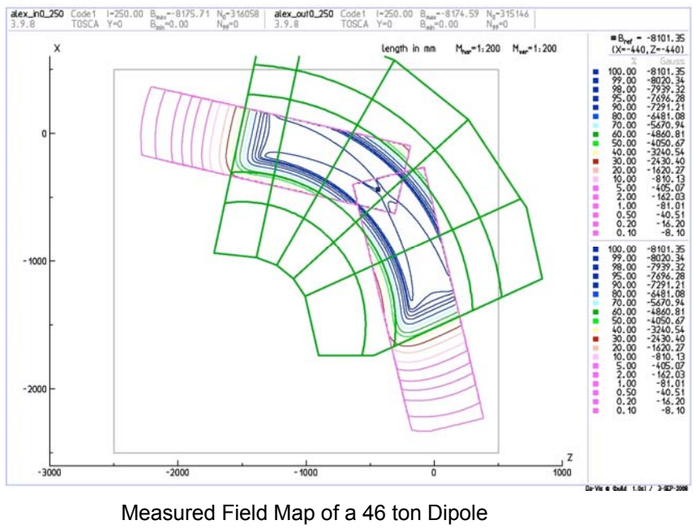
Covering the complete lifecycle of magnets:

- Specification
- Calculation
- Design
- 3D construction, production drawings
- Purchasing and manufacture
- Assembly
- Measurements
- Installation, commissioning
- Service and repairs
- Replacement, Recycling



3D magnetic field calculations with OPERA

The magnet measuring machine



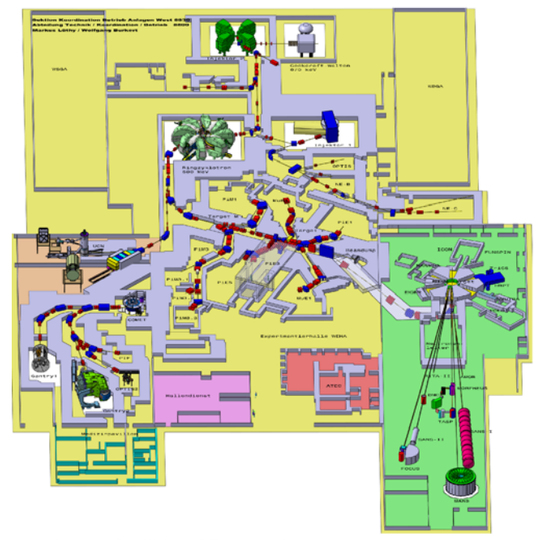
Measured Field Map of a 46 ton Dipole

Assembly of a radiation hard solenoid magnet

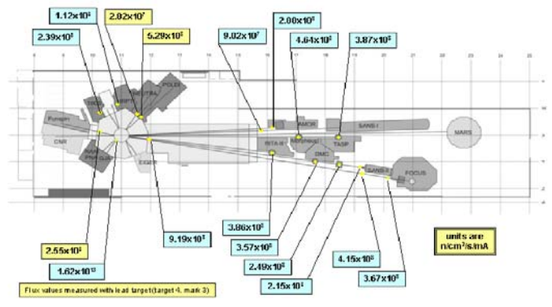
Challenge for 2009: Procurement and Commissioning of 70 Magnets for PSI-XFEL project

Coordination and Operations Section (11 Persons)

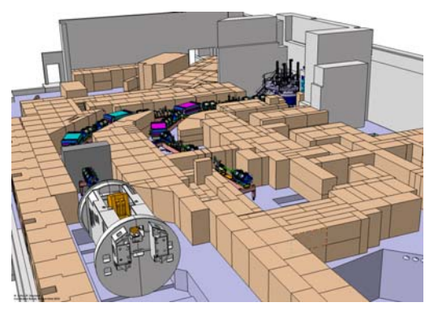
- Shutdown planning
- Project planning
- Time scheduling
- Documentation
- Assembly coordination
- 3D & 2D facility layouts
- Shielding (construction and handling)
- Interfaces
- Neutron flux measurements at SINQ



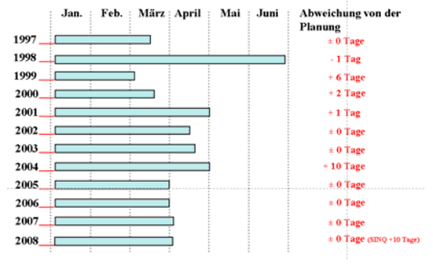
Large facilities 3D overview



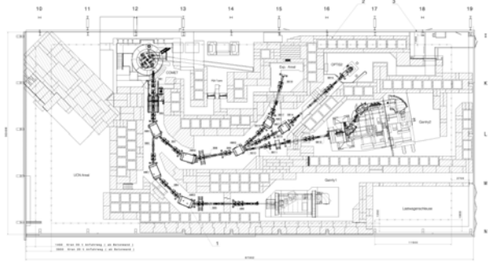
Neutron fluxes at SINQ measured by gold-foil activation



Shielding at the proton therapy facility PROSCAN



Comparison of the shutdown length



PROSCAN layout in CATIA

Challenge for 2009: Project Planning and Machine Layout for PSI-XFEL project