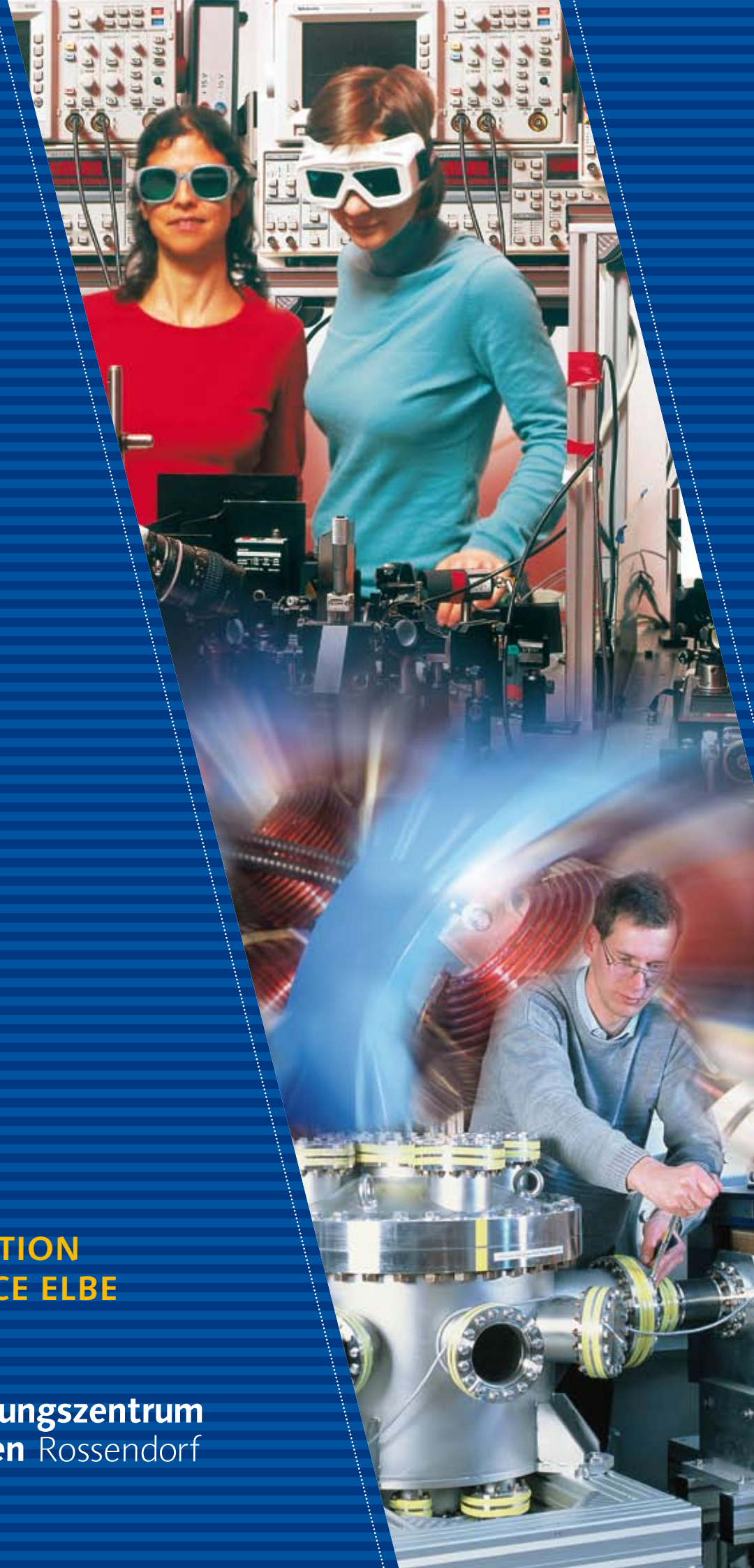


RADIATION SOURCE ELBE

Forschungszentrum Dresden Rossendorf

Facilities for Europe

The Radiation Source ELBE

At the heart of **ELBE** (**E**lectron **L**inear accelerator with high **B**rilliance and low **E**mittance) is a superconducting linear accelerator consisting of two modules which are cooled by liquid helium. It delivers a quasi-continuous electron beam up to 40 MeV beam energy at maximum beam currents of 1 mA. This primary beam is characterized by a low transverse emittance of better than 10 mm mrad (< 1 mm mrad has been achieved at low beam currents) and short pulses (typically 2 ps) with low energy spread and flexible temporal structure. The electrons at the Radiation Source ELBE are generated by a 250 keV thermionic DC electron gun. Alternatively, a superconducting RF electron gun (bunch charge up to 1 nC) is being developed.

The electron beam is characterized by a specific temporal structure:

- Quasi cw-operation
  Pulse length: 1 ps – 5 ps,
  typical repetition rate: ≤ 13 MHz
- Macropulse mode
  Pulse length: > 100 µs, repetition rate: < 25 Hz
- Single pulse mode
  A single "short" macropulse (containing 1 to 4096 micropulses) with repetition rate up to 1 kHz.

A variety of secondary radiation types is available for experiments.

Two Free-Electron Lasers (FELs) are funded as User Facility by the European Union. With undulators of 27 mm and 100 mm period length they deliver coherent radiation in the mid and far infrared. More precisely, the wavelength of the U27-FEL ranges from 3,5 to 22 µm while the U100-FEL covers the range from 20 µm to 250 µm.

- Pulse energy: < 2 µJ (depending on wavelength)
- Pulse length: 0.9 … 10 ps (depending on wavelength)
- Repetition rate: 13 MHz, modes: cw, macropulse (> 100 µs, < 25 Hz), reduced pulse rate with Hz/kHz

Neutrons

The high electron beam current allows generation of intense secondary neutron beams, either in reactions with a rotating tungsten disc or a liquid lead target (energy of the neutrons: max. 10 MeV). The generated neutron pulses carry the temporal structure of the primary electron beam, making them well suited for time-of-flight experiments.

Positrons

By pair production from the intense gamma radiation field, positrons are produced in a stack of tungsten radiator foils (max. 30 keV with up to 10^8 electrons • s^{-1}). These are extracted and delivered as a secondary beam for investigations in materials science.

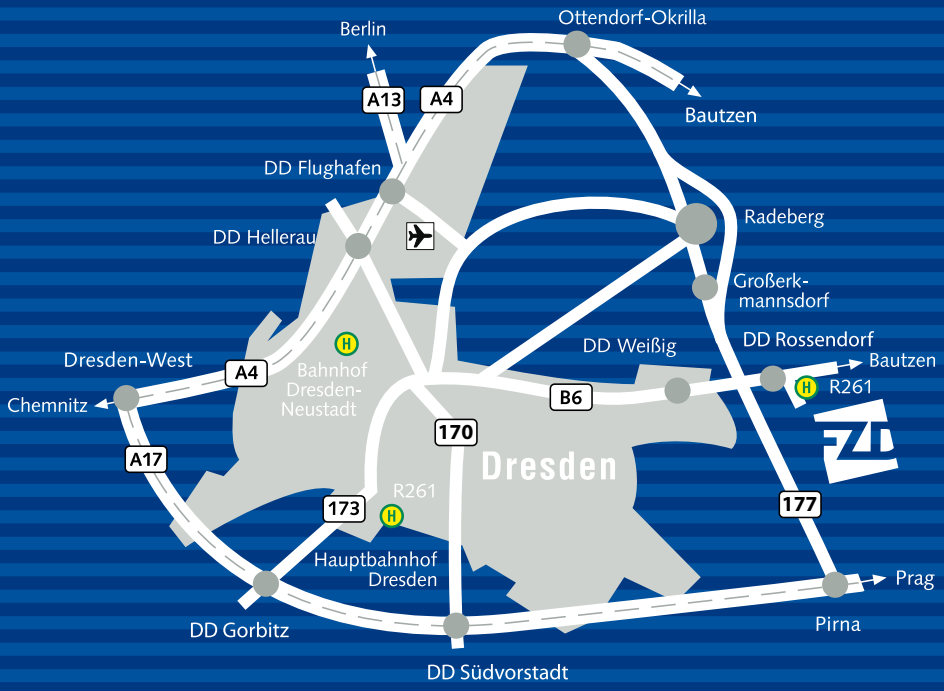
Bremsstrahlung

Hard X-rays (up to 18 MeV) are generated by irradiating a thin Nb target with the primary electron beam. The photon flux is 10^9 s^{-1}, with polarization of up to 30%. Furthermore, photoactivation of probes in the electron beam dump (photon flux about 10^{11} s^{-1}) can be performed as well.

Laser-Particle Acceleration

Recently, a high-power laser laboratory was established, which delivers 150 Terawatt laser pulses to targets (pulse energy & length: 4 J & 30 fs, repetition rate: 10 Hz). Laser-particle acceleration uses relativistic laser-plasma interaction to provide accelerating fields which exceed conventional ones by at least three orders of magnitude. Two target areas are available: one for laser irradiation of solid targets and applications of laser accelerated proton pulses. The other one is located inside an ELBE cave and is dedicated to experiments making use of the combined facilities.

Proposals for experiments at ELBE are evaluated twice a year for the periods January to June and July to December, respectively.
An application form is available on the following website:
http://www.fzd.de/user
Here, the precise deadline is published as well. The FEL, **FELBE**, is a member facility of the Integrated Infrastructure Initiative (I3) on Synchrotron and Free-Electron Laser Science (IA-SFS) within the 6th framework program of the EU. Due to this grant, users of **FELBE** can be financially supported („transnational access"). Submitted proposals are evaluated by the Scientific Advisory Committee of ELBE and by the FELBE EU facility access panel.



Forschungszentrum Dresden-Rossendorf (FZD)

Your contact:
Dr. Barbara Schramm
Scientific Communication
Bautzner Landstr. 400
D-01328 Dresden / Germany

Phone: ++49 351 260 2684
Fax: ++49 351 260 2700
E-Mail: b.schramm@fzd.de
www: **http://www.fzd.de/user**

Member of the Leibniz Association
07/2009