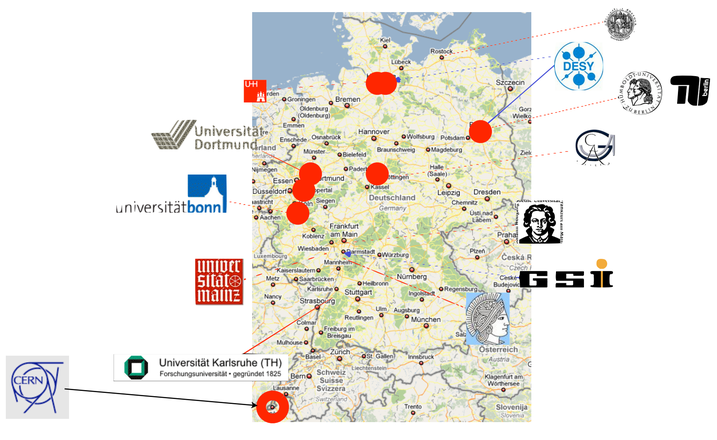
Project Accelerator

Goals of the Project Accelerator

The Project Accelerator tries to foster the education of prospective bright accelerator scientists that are needed to satisfy the demand for advanced accelerator physicists for the Terascale and beyond.

The scientific work focusses on advancing the concepts for high-energy, high-luminosity accelerators, in particular the e^+e^--Linear Collider, to a state that allows the cost-effective implementation. On a longer time scale novel acceleration concepts are being envisaged.

Participating Institutes



Location of the participating institutes and CERN

The Project Accelerator comprises the Universities

- Bonn
- Dortmund
- Hamburg
- Wuppertal and
- DESY

The University of Göttingen is participating in close collaboration with DESY, see below.

Education

Accelerator Schools

Posters of the Accelerator Schools

The annual *Terascale Accelerator School* is organized by the Project Accelerators of the Terascale Alliance. Lectures on Terascale Accelerators, notably the Large Hadron Collider and e^+e^- - Linear Colliders are offered to Master and Diploma students, who are not familiar with the topic. In fact, the courses are open to students after their 6th semester, i.e. after completing the basic education. Before concentrating on specific accelerator examples and their challenges an introduction into basic accelerator physics and the challenges of Superconducting RF acceleration forms part of the programme.

Participants of the TAS2009 School in Bommerholz

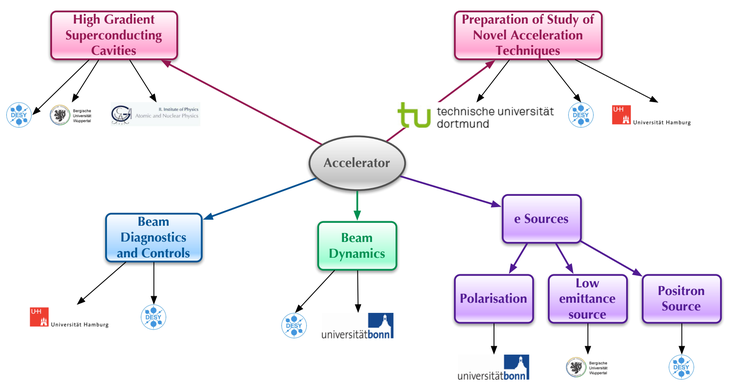
Key to the success of the school are hands-on exercises in which the participants design their own little accelerator, i.e. its optics description.

University Lectures

With accelerator physics often not contained in the curriculum of universities DESY staff tries to fill this void. Since the start of the Terascale Alliance a combined lecture and exercise course (2h each) has been offered at the University of Göttingen. The course has been well accepted by interested student and so far led to a Bachelor and Master thesis in accelerator science.

In fact, the promotion of accelerator physics at the Terascale has furthered the exchange of students between institutions. Students from Bonn and Mainz have begun their PhD thesis at DESY/University of Hamburg and students of Hamburg University have started their Diploma work at CERN, jointly supervised by CERN staff and professors of Hamburg University.

Research Topics in Brief



The Research Topics and the participating institutes.

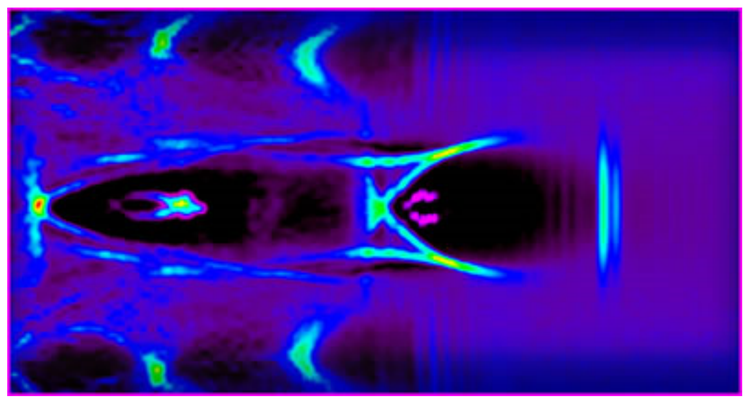
The research topics of the Project Accelerator are

- High-gradient superconducting cavities
- Beam diagnostics and Controls
- Beam dynamics
- e^- sources
  - Polarisation
  - Low emittance source
  - Positron source

Preparation of Study of Novel Acceleration Techniques

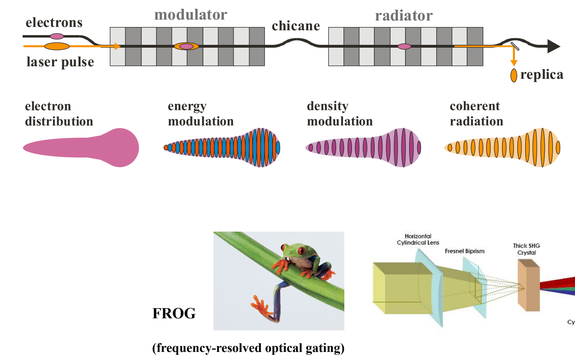
For the next leap in energy accelerating gradients above 1 GV/m have to be mastered. Currently no concept for an accelerator capable of reaching far into the Teracale is available.

Recently several experiments have been carried out that use a plasma to accelerate electrons with electric fields exceeding 1 GV/m. Such plasmas can be excited by high power lasers or short particle bunches. Institutes of the Terascale Alliance are prepared to explore some aspects of these developments. The Young Investigator Group for Accelerator Physics is currently being installed at Hamburg University.



Laser Plasma Acceleration

With the success in acceleration the bunches have to be precisely characterized to enable any further progress in the field.



FROG technique resolves the temporal structure of a bunch and is proposed as a tool to diagnose bunches accelerated in a plasma.

Rheinische Friedrich-Wilhelms-Universität Bonn … Technische Universität Dortmund …
Deutsches Elektronen-Synchrotron DESY … Georg-August Universität Göttingen …
Universität Hamburg … Bergische Universität Wuppertal