

DITANET

A Marie Curie Initial Training Network on Novel Diagnostic Techniques for Future Particle Accelerators

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Abstract

Beam diagnostics systems are essential constituents of any particle accelerator; they reveal the properties of a beam and how it behaves in a machine. Without an appropriate set of diagnostic elements, it would simply be impossible to operate any accelerator complex let alone optimize its performance. Future accelerator projects will require innovative approaches in particle detection and imaging techniques to provide a full set of information about the beam characteristics.

The European Training Network DITANET covers the development of advanced beam diagnostic methods for a wide range of existing or future accelerators, both for electrons and ions. The developments in profile, current, and position measurement techniques stretch beyond present technology and will mark the future state of the art. This contribution presents the scientific challenges that will be addressed within the next four years, together with the networks' structure.

Network Members



Associated Partners

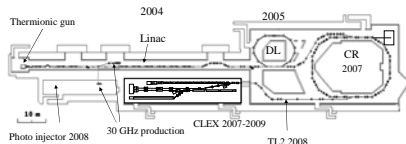


Research

The accelerator projects that will be covered within DITANET range from the next generation of linear colliders (ILC, CLIC) and the most advanced high energy accelerators (LHC, FAIR), to innovative light sources (X-FEL) and novel low-energy storage ring projects (DESIREE, USR). Only some examples of the research projects within DITANET can be outlined here (see paper for further details).

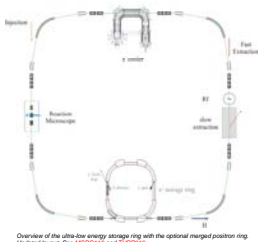
Beam Diagnostics for CLIC

One of the major decisions in particle physics over the next 3 years will be to decide on the next major accelerator to access the TeV energy scale.



The CLIC two-beam acceleration scheme is one of the promising candidates, with the CLIC Test Facility (CTF3) at CERN being the unique facility to test the CLIC acceleration principle and to prove the feasibility of associated RF systems. It is furthermore an ideal testing ground for beyond-state-of-the-art beam loss monitors, new longitudinal and transverse beam profile monitors, as well as for cavity-BPMs.

The USR at FLAIR



The ultra-low energy storage ring is a central element of the FLAIR facility and will decelerate antiprotons and possibly highly charged ions to energies as low as 20 keV/q. In order to achieve reasonable lifetimes, extremely low vacuum pressures are required, which can only be achieved by cooling the whole machine to temperatures of some Kelvin.

The USR's beam diagnostic systems shall measure beam intensities between 10^4 - 10^7 ions, the beam position with at least 10 μm resolution, as well as the longitudinal time structure that can range between some nanosecond pulses to DC beams in the whole energy range.

Training

Young researchers participating in the network program will not only get the possibility to perform state-of-the-art research, they will also get a much wider training in the domain of beam diagnostics by interaction with other network participants and close collaboration with associated partners from the industrial sector.

While helping young researchers to put together their individual training plan at each of the institutes, DITANET will also promote a multidisciplinary training in the wider field of beam diagnostic techniques. This responds to the need for strong interdisciplinary skills and expert knowledge in a range of different diagnostic techniques.

DITANET will organize one week courses on beam diagnostic techniques in spring 2009 (London) and fall 2010 (Stockholm) that will be open to all network participants as well as to external participants.

Details on these courses will be published on the DITANET web site

Conclusion and Outlook

The largest ever coordinated EU education action for young researchers in the field of beam diagnostic techniques for particle accelerators has been awarded to a consortium of ten partners from all over Europe within the EU-Marie Curie program for initial training networks.

The joint effort in setting up DITANET and the corresponding administrative and training-related boundary conditions will guarantee a continuous training of young researchers in this field. Close collaboration between the network participants and the associated partners with a very prominent role of industry, ensures that the basis for DITANET is laid in a true international approach with a clear long term perspective.

The network encourages young researchers to apply for one of the vacant positions and invites scientists and institutes to join in to the network's activities.