« novel Diagnostic Techniques for future particle Accelerators: A Marie Curie Initial Training NETwork »

Carsten P. Welsch
- On behalf of the DITANET Consortium -
Outline

- What is DITANET?
- Involvement of Industry
- Research
- Training
- What does it mean to you?
A „typical“ Monitor

- Material sciences
- Thermodynamics
- Electro-Magnetism
- Optics
- Mechanics
- Electronics
- Nuclear Physics
- …

Multi-disciplinary field!
What is DITANET?

- One of the largest Marie Curie Initial Training Networks ever funded by European Union!
- Funding for 20 fellows (17 ESR and 3 ER)
- Gives industry an important role!
- Allows for inter-sectorial collaboration!
- Recognized importance of beam diagnostics at European level!

(in physics top 12, 2007 – under extreme competition)
The DITANET Consortium

Network Participants

Associated Partners
## Including Partners From Industry

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Full Network Partner: Offer research training &amp; <strong>Recruit</strong> eligible researchers</td>
</tr>
<tr>
<td>2</td>
<td>Associated Partner: Provide research training, <strong>complementary skills courses</strong>, (communication, enterprise cycles, innovation, IPR, ...) <strong>secondments</strong></td>
</tr>
<tr>
<td>3</td>
<td>Member of the <strong>Supervisory Board</strong>: definition of skills requirements for targeted researchers</td>
</tr>
</tbody>
</table>
Including Partners From Industry
Examples from the Research Program

XFEL

CTF3

USR @ F(L)AIR
The XFEL Project

The European X-ray laser project XFEL
Planning status October, 2003

XFEL site ± 50 m
Options for expansion
1000 m

K. Wittenburg
Wire Scanners

..established for measurements in accelerators.

Advantages:

- Resolution: 1 µm
- Reliable
- Direct

K. Wittenburg
Challenge: Heat Load on Wire

\[-\frac{dE}{dx} = \frac{4\pi}{m_e c^2} \cdot \frac{nz^2}{\beta^2} \cdot \left(\frac{e^2}{4\pi\varepsilon_0}\right)^2 \cdot \left[ \ln \left( \frac{2m_e c^2 \beta^2}{I \cdot (1 - \beta^2)} - \beta^2 \right) \right] \]

\[T = C \cdot \frac{dE}{dx} \cdot d' \cdot N \cdot \frac{1}{c_p \cdot G} \quad [°C] \]

\[T_{\text{max}} \sim 2000°C\]

\[N = \frac{d' \cdot f_{\text{rev}}}{\nu} \cdot (NB \cdot n_{\text{Bunch}}) \]

**Required**: Speed of 10-20 m/s with 1 µm resolution.

K. Wittenburg
CTF3 - Overview

Thermionic gun

Linac

2004

Photo injector / laser tests from 2008

30 GHz production (PETS line) and test stand

CLEX 2007-2009 building in 2006

TL2 2008

2005

G. Blair, E. Bravin, T. Lefevre
CTF3: An Ideal Testing Platform

- Time-resolved spectroscopy
- Beam Halo Monitoring
- Simulation of CDR; compare to measurements
- Beam position monitors
- ITB instrumentation

G. Blair, E. Bravin, T. Lefevre
FLAIR @ Facility for Antiproton and Ion Research

30 MeV - 300 keV
300 keV - 20 keV
keV - ... eV
USR - Challenges

- E = 20 keV – 300 keV
- Vacuum < 10^{-13} mbar
- Diagnostics at 4K
- $10^4 – 10^7$ ions
- 2 ns – DC beams
- ...
Training

- Local training by host
- Network-wide schools on diagnostic techniques
- Inter-network exchange of researchers
- Secondments to partners from industry
- Training in complementary skills

Motivation: *Ideal* Training.
Outreach

- DITANET schools in 03/2009 (London) and 09/2010 (Stockholm)
- DITANET conferences in 2009 and 2011 (DIPAC ?!)
- Mini-Symposia, workshops throughout 4 years

Open to external participants.
What DITANET means to you

DITANET.uni-hd.de

Supervisor

Young Researcher

Scientist

Join in!

c.welsch@gsi.de
Conclusion

- Unique opportunity to push our field
- Development of new techniques through joint effort between research centers, Universities and the private sector;
- Innovative approach to training of young researchers;
- Many events interesting for the whole community;
- Stimulation of research careers in beam diagnostics.

Please take a copy !!!
USR - Goals

- Variable to lowest energies
  - 300 keV ~ 20 keV

- High luminosity for in-ring experiments

- Well-defined extracted beams:
  - Small emittance
  - Small momentum spread

- Multi-user operation:
  - 2 straight sections for in-ring experiments
  - Slow and fast extraction
  - Additional beam lines possible

- Central requirements
  - $\Delta t \sim 500$ nsec for Injection in traps
  - $\Delta t \sim 2$ nsec / $10^4$ ions for collision studies

\[ T_{\text{Rev}}(p\bar{b}; 20\text{keV}) = 15 \mu\text{sec} \]

\[ \text{Umfang} = 30 \text{ m} \]

\[ 4 \text{ mm} \]
Management Structure

Supervisory Board
One representative of each network participant and associated partner

Network Coordinator

Steering Committee
Elected from network participants and associated partners

European Commission

Management Office

Spin-off Board

Associated Partners

DITANET Participant 1

DITANET Participant 2

DITANET Participant 9

DITANET Participant 10

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Research

- Development of beam diagnostic techniques for future particle accelerators (LHC, FAIR, XFEL, and small-scale projects)
- Interdisciplinary approach
- Close collaboration with partners from industry

Aim: XXX
Measurement

(1) Acquire profile
(2) Define core
(3) Generate mask
(4) Re-Measure
Recruitment Strategy

After acceptance

Final Definition
of all career development plans.

Formalizing secondments and time schedule.

DITANET kick-off meeting

Publication of Positions
online and in relevant international journals.

Direct contact to prospective candidates.

End June

Screening of Applications
Criteria: letter of intent, academic records, two letters of recommendation

In case several candidates are eligible:
Selection board

Interviews and Selection Board
Criteria: international competition, direct comparison between applicants.

Ensure gender balance, equal opportunities to candidates from within/outside network.

Soon thereafter

Decision
Based on agreement between host team, thematic partners and coordinator.

Goal
Fill all positions until september 2008.
## Auswahl von Kandidaten

<table>
<thead>
<tr>
<th>Trainingsinitialisierung</th>
<th>Qualifikationskriterien zum Zeitpunkt der Berufung</th>
<th>Dauer der Aufträge</th>
</tr>
</thead>
</table>
| Frühstadienforscher (≥ 80%) | $0 \leq$ Research experience $\leq 4$ years  
No PhD | 3-36 months |
| Erfahrene Forscher | PhD or at least 4 years of research experience  
& Research experience $\leq 5$ years | 3-24 months |
| Besucherforscher (a limited number) | Experienced researchers (experience $>> 4$ years)  
with outstanding stature in international training and collaborative research | $\geq 1$ month  
Multiple stays |