

WP5: Education and Training for Accelerator Sciences



**WP5 supports education and training
in accelerator science.**



Human resources are the key elements
for the construction of accelerators.

The main objective of this work package is
the development of structures and mechanisms that allow
efficient education and training of human resources
and facilitate their exchange among the partner facilities.

WP5 will provide extensive information for the research
community through web-based tools.

WP5: Education and Training for Accelerator Sciences



WP5 PARTICIPANTS / CONTACTS



- 1 CEA: *Phu-anh Phi Nghiem [Francois Kircher*
- 2 CERN: *Roger Bailey [Daniel Brandt],
Kate Kahle (EUCARD) [Naomi Gilraen Wyles],
Louis Rinolfi (JUAS)*
- 3 CNRS: *Alex Muller, Catherine Clerc*
- 4 CIEMAT: *Marisa Marco, Diego Obrador, Susanna
Falcon*
- 5 GSI: *Oliver Boine-Frankenheim, Sabrina Appel*
- 6 INFN: *Vittorio Vaccaro*
- 7 PSI: *Lenny Rivkin*
- 8 STFC: ***Philip Burrows, Max Bradbury***
- 9 Nordic group: *Soren Pape Moeller + Ole Petter Nordahl*
- 10 IFJ PAN: *Piotr Malecki*

WP5: Education and Training for Accelerator Sciences



WP5 at work:



PHONE
06.01.2011

DRAFT VERSION of QUESTIONS for our WWW
BASED SURVEY

IN-PERSON
23-24.02.2011

24.05.2011

REVISED SURVEY PROFORMA

25.07.2011

01.09.2011

LIST OF INSTITUTIONS TO BE INTERROGATED
(Poland – 19)
PREPARED TO LAUNCH THE SURVEY

04.10.2011

SURVEY UPDATE
FIRST ANALYSES
FINAL DATA

02.11.2011

23.02.2012

NATIONAL CONTACTS' CHECKS
DISCUSSION OF DRAFT SURVEY REPORT
REPORT READY

27.01.2012
30.03.2012

31.05.2012

05.06.2012

TEMPLATE OF MARKET SURVEY
DRAFT USER FRONT-END TO THE TRAINING
DATA BASE

12-13.06.2012

21.09.2012

<http://tiara.physics.ox.ac.uk/database-of-survey-results/>

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WP5 at work:

SOME EXTRACTS FROM TRAINING INQUIRY



Do you offer training to:
undergraduates
masters-level students
PhD students
post-doctoral fellows (not permanent appointments)
staff (permanent appointments)
others [specify]

How many students do you send to:
CAS
JUAS
USPAS
Linear Collider School
Other accelerator schools [which?]

Do you participate in the CERN Doctoral Training programme? yes/no

Are there formal examinations?
Which books do you use for teaching? [eg. Ted Wilson]
What other teaching materials do you use? [provide link to teaching materials]
Do you participate in the ECTS scheme?
Do you use local or national accelerator facilities for 'hands-on' training?

Do your faculty members provide accelerator training at other institutions (eg. national laboratories, or other universities)? [specify institutions]

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WP5 will provide extensive information for the research community through web-based tools.

... and it does!

**Education and Training Resources Data base :
Deliverable 5.2**

**TIARA-MISC-WP5-2012-001.- Geneva : CERN, 2012
Fulltext: XLSX;**

*... this data base has then been
analysed and:*

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TIARA WP5 Deliverable 5.1 - ETR Education and Training Survey Report 25 June 2012

François Kircher, Phu-Anh-Phi Nghiem, CEA, France

Roger Bailey, Louis Rinolfi, CERN, Switzerland

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Catherine Clerc, Alex C. Mueller (WP Deputy), CNRS/IN2P3/LLR, France

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Piotr Malecki, Institute of Nuclear Physics, Polish Academy of Sciences, Poland

Søren Pape Møller, ISA, Aarhus University, Denmark

*Philip Burrows (WP leader), Max Bradbury, John Adams Institute, University of Oxford,
United Kingdom*

Pauli Heikkinen, University of Jyväskylä, Finland

Ole Petter Nordahl, Steinar Stapnes, University of Oslo, Norway

TIARA-REP-WP5-2012-006.- Geneva : CERN, 2012

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EXECUTIVE SUMMARY

- 88 institutes from Denmark, Finland, France, Germany, Greece, Italy, the Netherlands, Norway, Poland, Spain, Sweden, Switzerland and the United Kingdom completed the TIARA survey on education and training in accelerator science. A total of 3060 personnel at these institutes are engaged in accelerator science activities.
- 75 institutes (85%) provide training of some kind in some aspects of accelerator science to their own students or staff. 195 personnel are involved in providing training. 49% of institutes provide training to undergraduates, 64% to master's students, 70% to PhD students; 44% to postdoctoral fellows, and 24% to staff.
- 83 institutes (94%) send people for training to accelerator schools and workshops, and 30 institutes (34%) have staff members who provide training at the schools and workshops.
- 1371 people per annum currently receive training, which comprises: 34% undergraduates, 26% master's students, 14% PhD students, 7% postdoctoral fellows and 17% staff.
- 55 institutes reported the number of formal training hours provided per annum. Currently a total of 62,777 training hours per annum are given: 46% to master's students, 27% to undergraduates, 13% to PhD students, 10% to staff and 3% to postdoctoral fellows.
- Accelerator science typically represents a small fraction (below 30%) of total formal training time for undergraduate, master's and PhD students, and typically a larger fraction for postdoctoral fellows and staff. There are only a handful of dedicated full-time formal training programmes in accelerator science.

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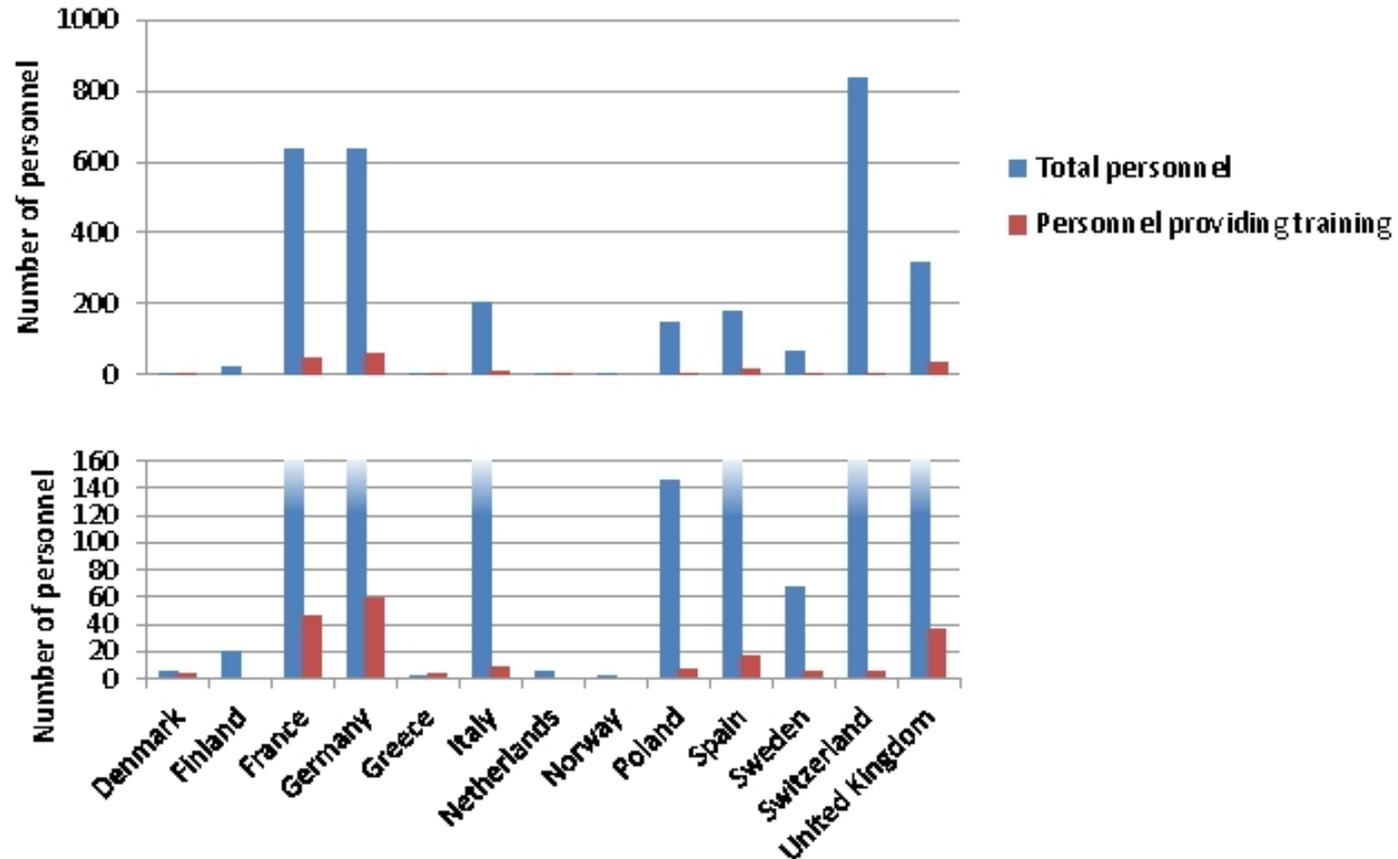


Figure 2.1: Top: total number (blue) of personnel (physicists and engineers) engaged in accelerator science activities by country. For each country the number of personnel engaged in training in accelerator science is also shown (red). Bottom: a 'zoom' into the region below 160 personnel per country.

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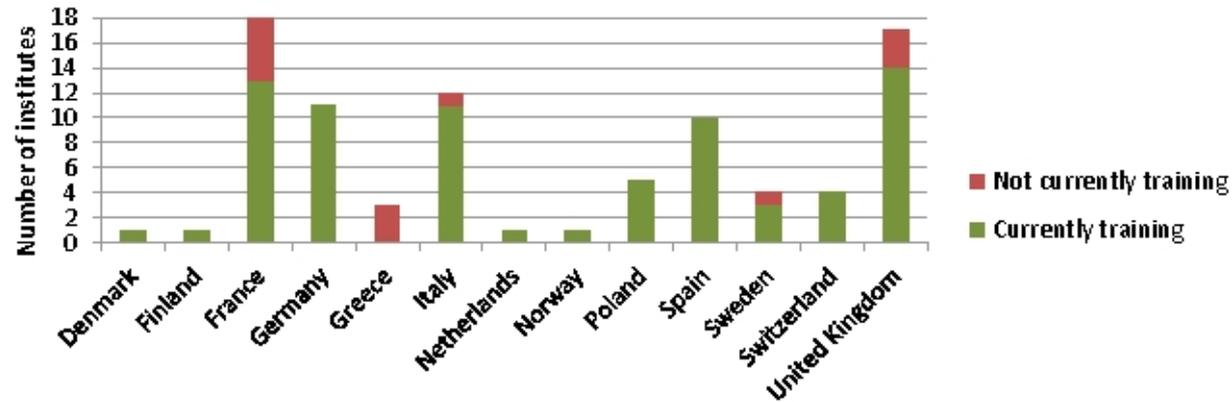


Figure 3.1: The number of institutes per country that responded to the survey. Those institutes that currently offer training in accelerator science are represented in green, and those that do not are represented in red.

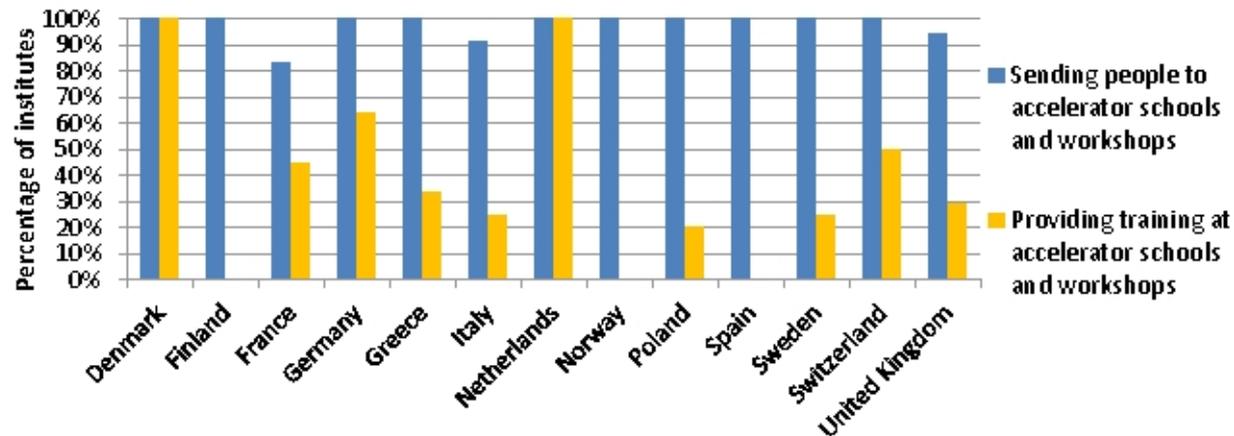


Figure 3.2: The percentage of responding institutes in each country that send people for training to accelerator schools and workshops (blue), and that provide training at accelerator schools and workshops (orange).

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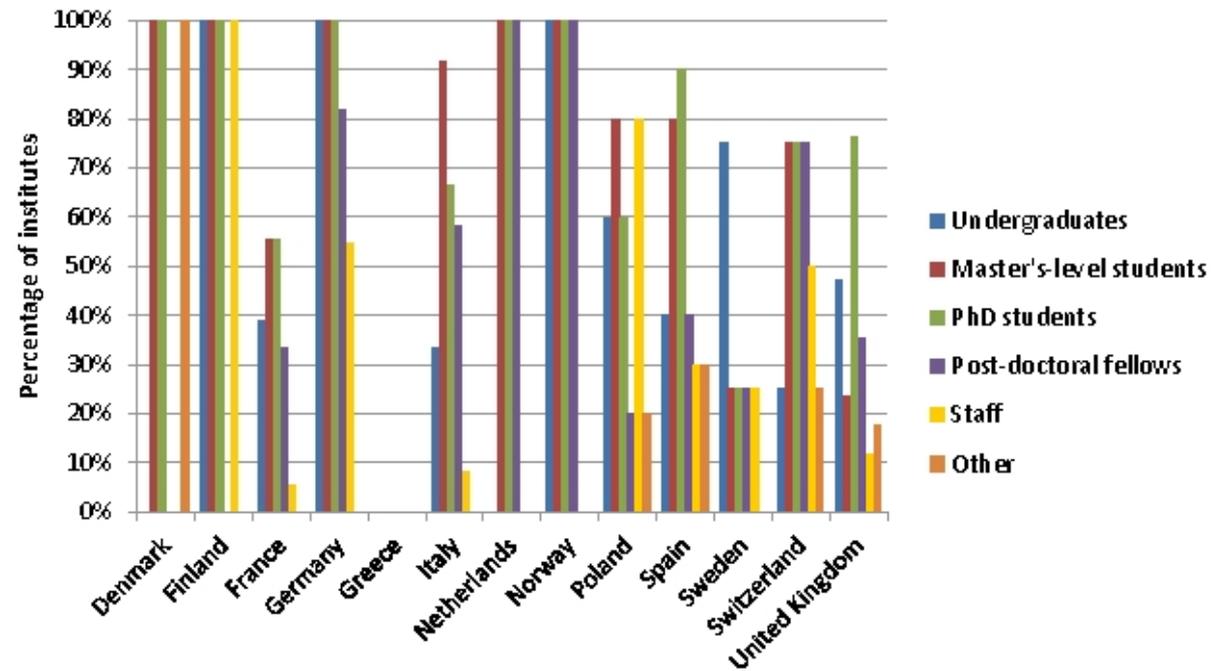


Figure 3.3: The percentage of responding institutes in each country that currently offer training to each category of trainee.

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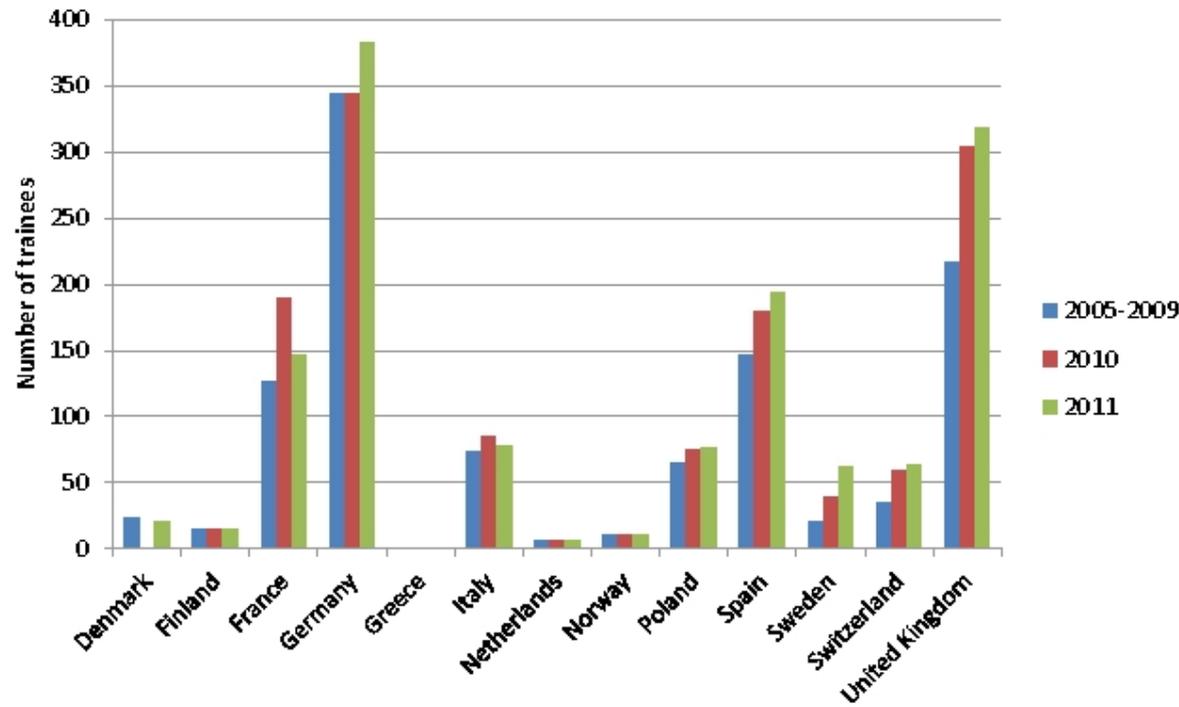
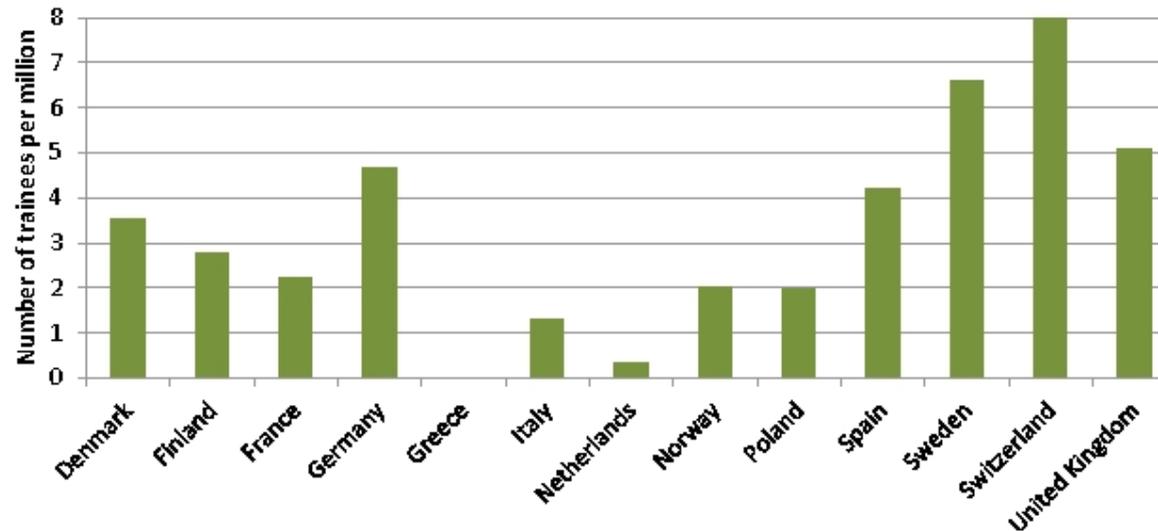


Figure 4.3: The total number of trainees in each country. Data are shown for the academic year 2011 (green), 2010 (red) and the average per year over the 5 years 2005-2009 (blue).



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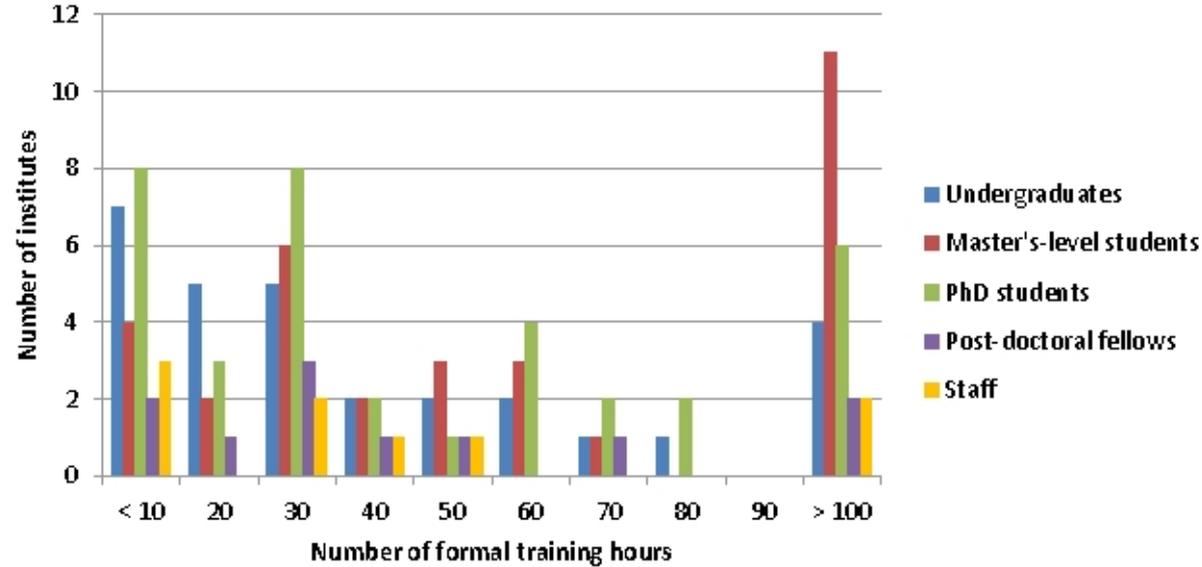


Figure S.1: Distribution of the number of formal training hours provided. Data are shown for separate categories of trainee. Zeroes have not been displayed. The bin width is 10 hours.

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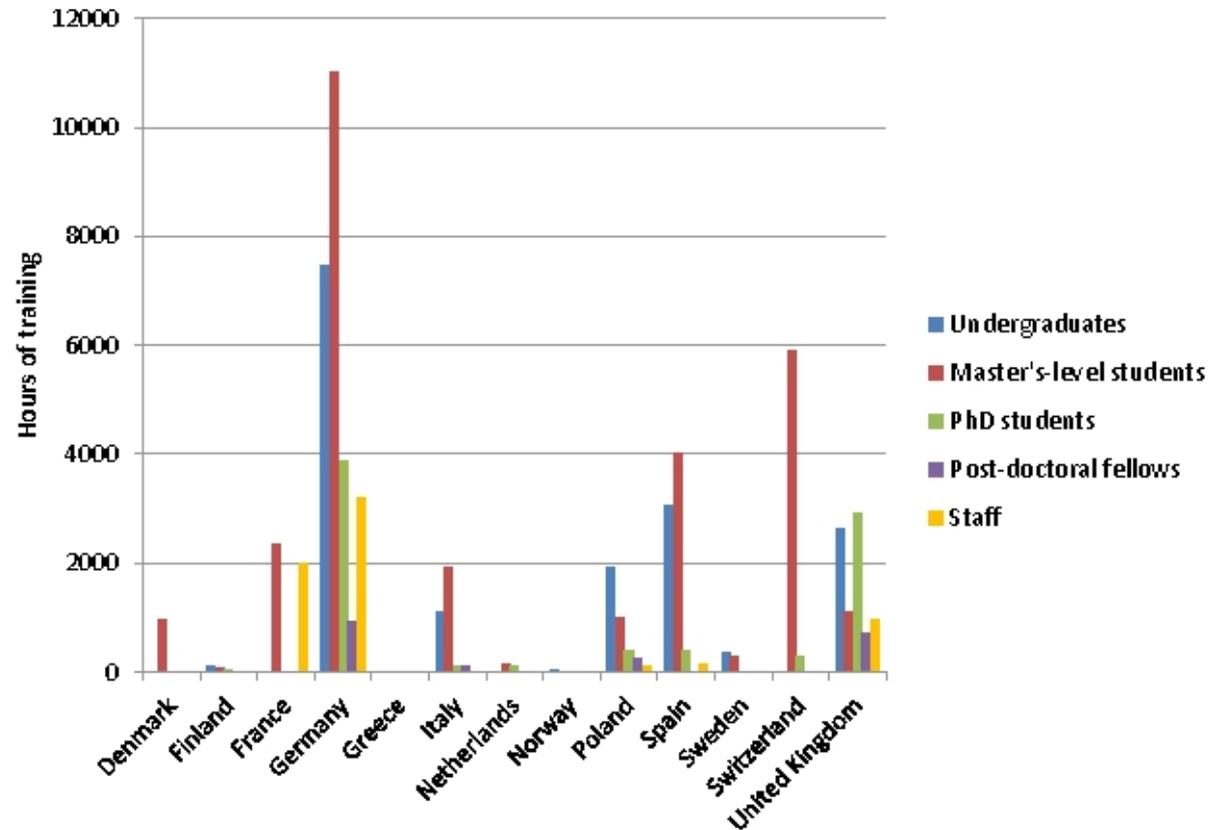


Figure 5.4: The total number of accelerator science formal training hours reported by institutes that offer training to each category of trainee, by country.

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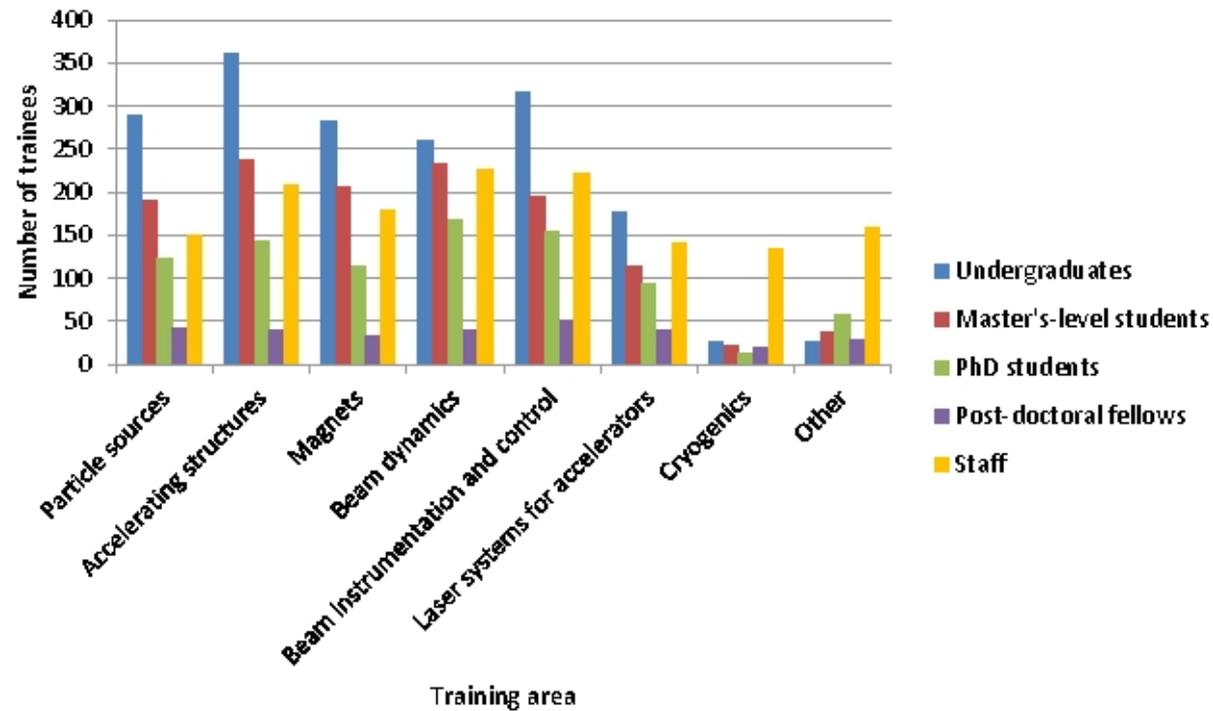


Figure 6.1: Number of trainees versus training area and by category of trainee.

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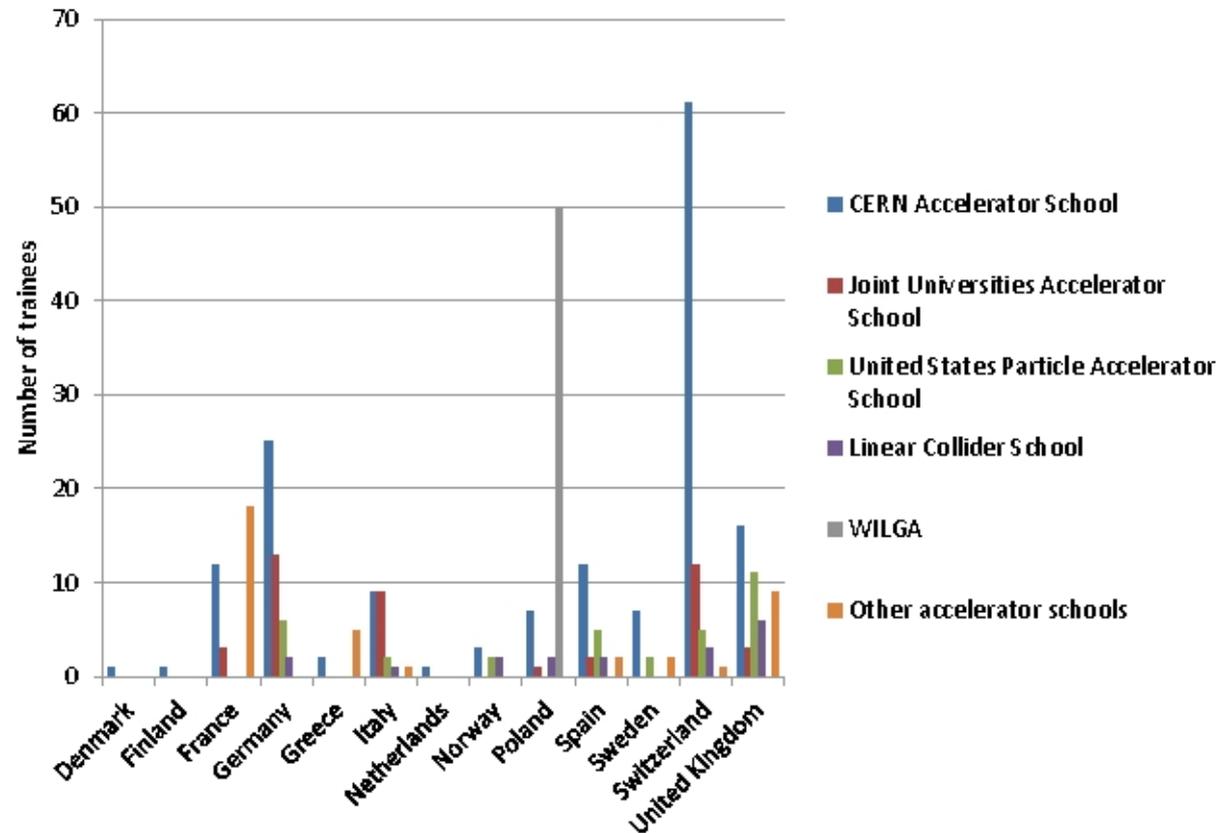


Figure 7.1: Number of trainees attending international and national accelerator schools, by country.

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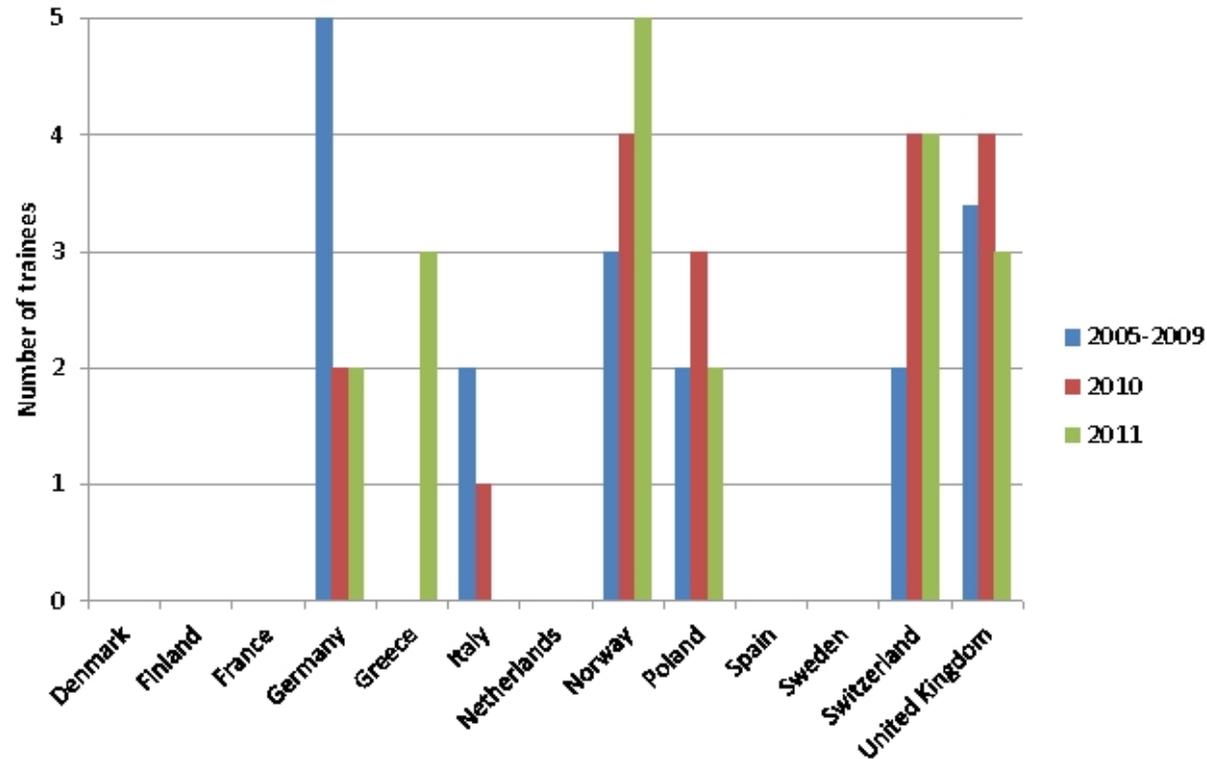


Figure 7.3: Numbers of trainees reported as participating in the CERN Doctoral Student Programme, by country. Data are shown for trainees commencing in the academic year 2011 (green), 2010 (red) and the average commencing per year over the 5 years 2005-2009 (blue).

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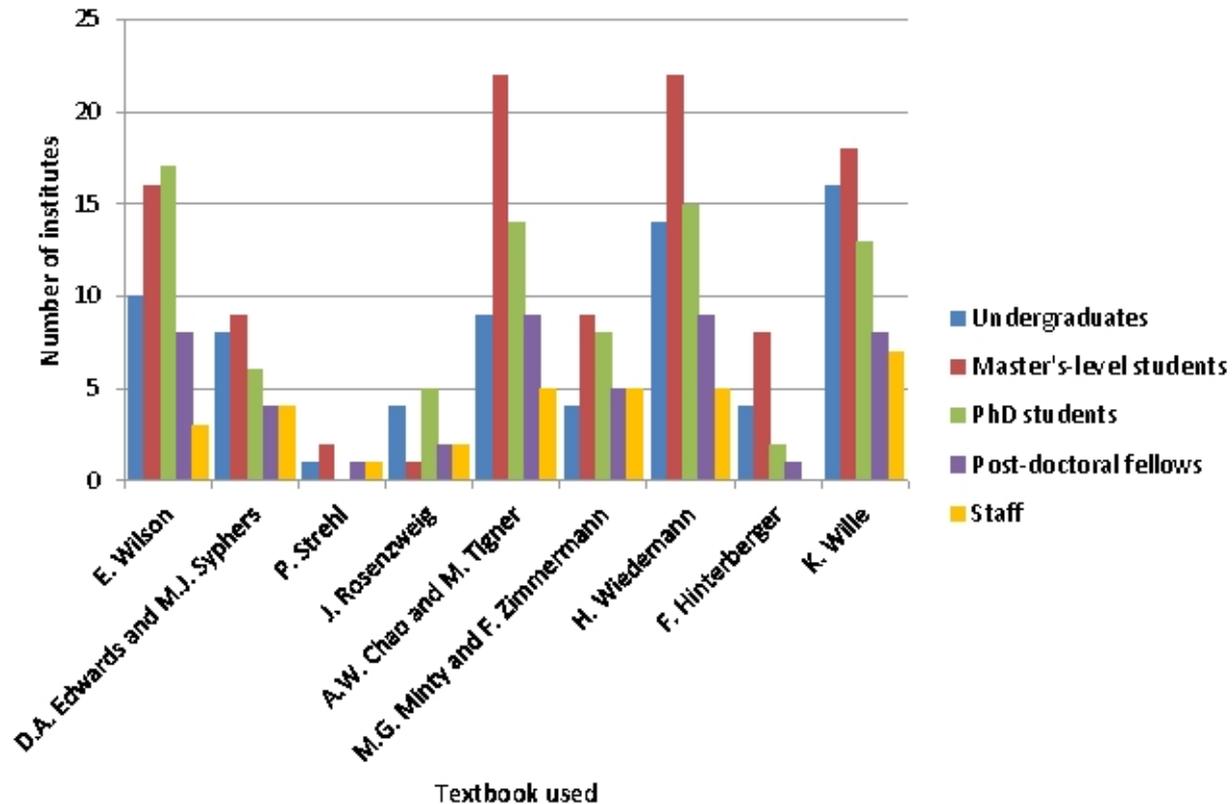


Figure 8.1: Number of institutes using well known accelerator text books for training, by category of trainee.

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WP5 at mid-term ...



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- **Complete task 5.1: Survey of accelerator sciences**
- **Produce the education and training survey report (D5.1 due in October 2011)**
- **Release the education and training survey database (D5.2 due in February 2012)**
- **Start task 5.2: Market for accelerator sciences**
- **Start task 5.3: Plan for promoting accelerator sciences**

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Accelerator science & engineering personnel numbers	Physicists	Engineers	Technicians	Total
How many of the following personnel do you have who are engaged in accelerator projects?	2	1	1	4
How many do you expect to have in 5 years?	3	3	2	8
How many do you recruit in a typical year?	1	1	1	3
For engineering personnel: specify the field of speciality (e.g. mechanical, electrical...)	mechanical (design), microwave (measurements)			

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Accelerator science & engineering personnel numbers	Physicists	Engineers	Technicians	Total
How many of the following personnel do you have who are engaged in accelerator projects?	10	20	30	60
How many do you expect to have in 5 years?	15	40	50	105
How many do you recruit in a typical year?				

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