The Cockcroft Institute
of Accelerator Science and Technology

Universities meet Laboratories : UK

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University of Manchester / Cockcroft Institute
UK

30/09/14 – 01/10/14

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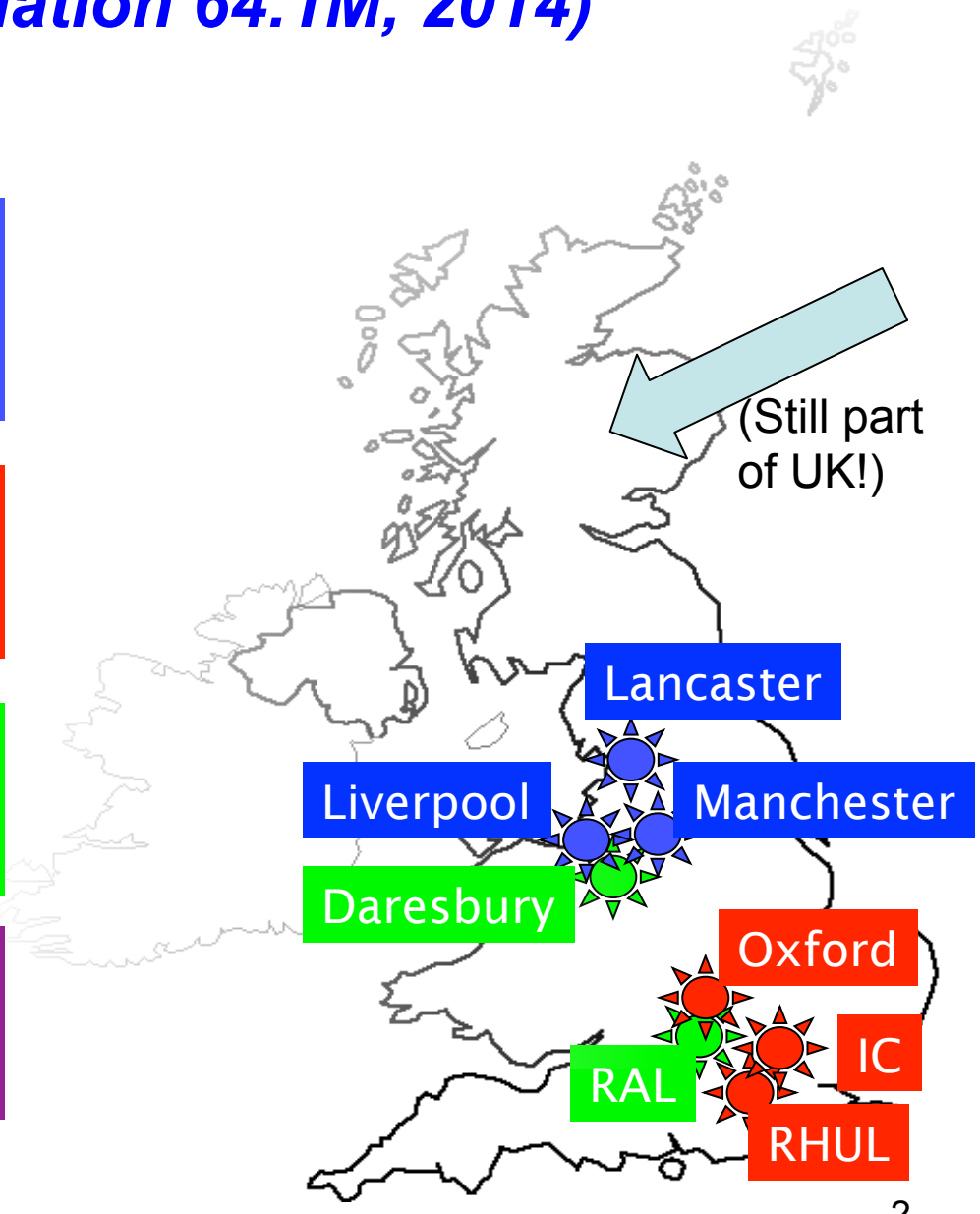
Geography of the UK
(Population 64.1M, 2014)

Cockcroft Institute
Lancaster, Liverpool, Manchester, and STFC

John Adams Institute
Oxford, RHUL, IC

National Laboratories
Daresbury, RAL

Other University Groups
e.g. Strathclyde, Huddersfield



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Recent (ish) history

- The National Institute for Research in Nuclear Science (NIRNS) **was formed in 1957**, and mergers in 1975 and **in 1979 formed the Rutherford-Appleton laboratory, now with around 1200 people.**
- **Daresbury Laboratory started in 1962, now with around 300 staff.**
- Some research council funding of linear collider and neutrino factory from 1999

- **ASTeC** (The accelerator science and technology centre) was created in the national labs in 2001. Now around 60 staff.

- **Starting in 2002, the UK research councils made a targeted effort to re-establish and develop a UK-based accelerator science and technology capability**
- Two new Institutes established by the research council STFC:
  - John Adams Institute. Now around 40 academic/research staff.
  - Cockcroft Institute. Now around 50 academic/research staff.

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The UK programme I

- Support for the Cockcroft and Adams Institutes, university rolling grant effort, accelerator groups at RAL and DL + underlying technologies
- LHC and its upgrade (HiLumi LHC)
- ISIS
- DIAMOND
- High Power Proton Accelerators – front end test stand for MW ISIS upgrade (FETS)
- Future lepton colliders (mainly CLIC with CERN, and muon accelerator contributions)
- Novel accelerator techniques (FFAG, AWAKE, Laser Plasma)

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The UK programme II

- UK FEL
- Generic target studies
- VELA, CLARA, ALICE, EMMA
- Laser plasma work at CLF, IC, JAI, Strathclyde and partners
- The MICE experiment at RAL
- Medical applications (EMMA, ALICE…)
  - Proton Therapy (Christies Hospital Manchester, UCLH London)
  - Medical Diagnostic Radio-isotopes etc.
  - THz imaging for diagnosis of oesophegal cancer

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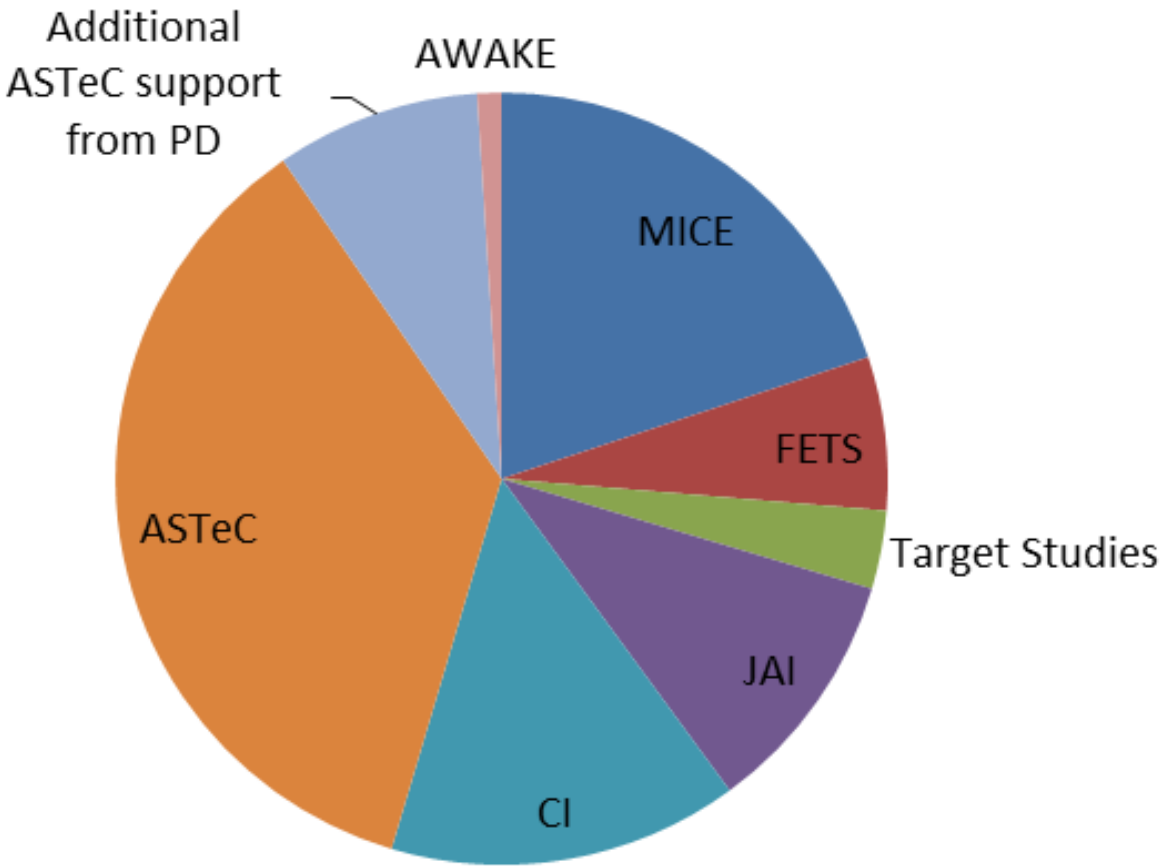
Breakdown of accelerator funding *from the research council STFC*



Note : list of accelerators in the UK in the appendix

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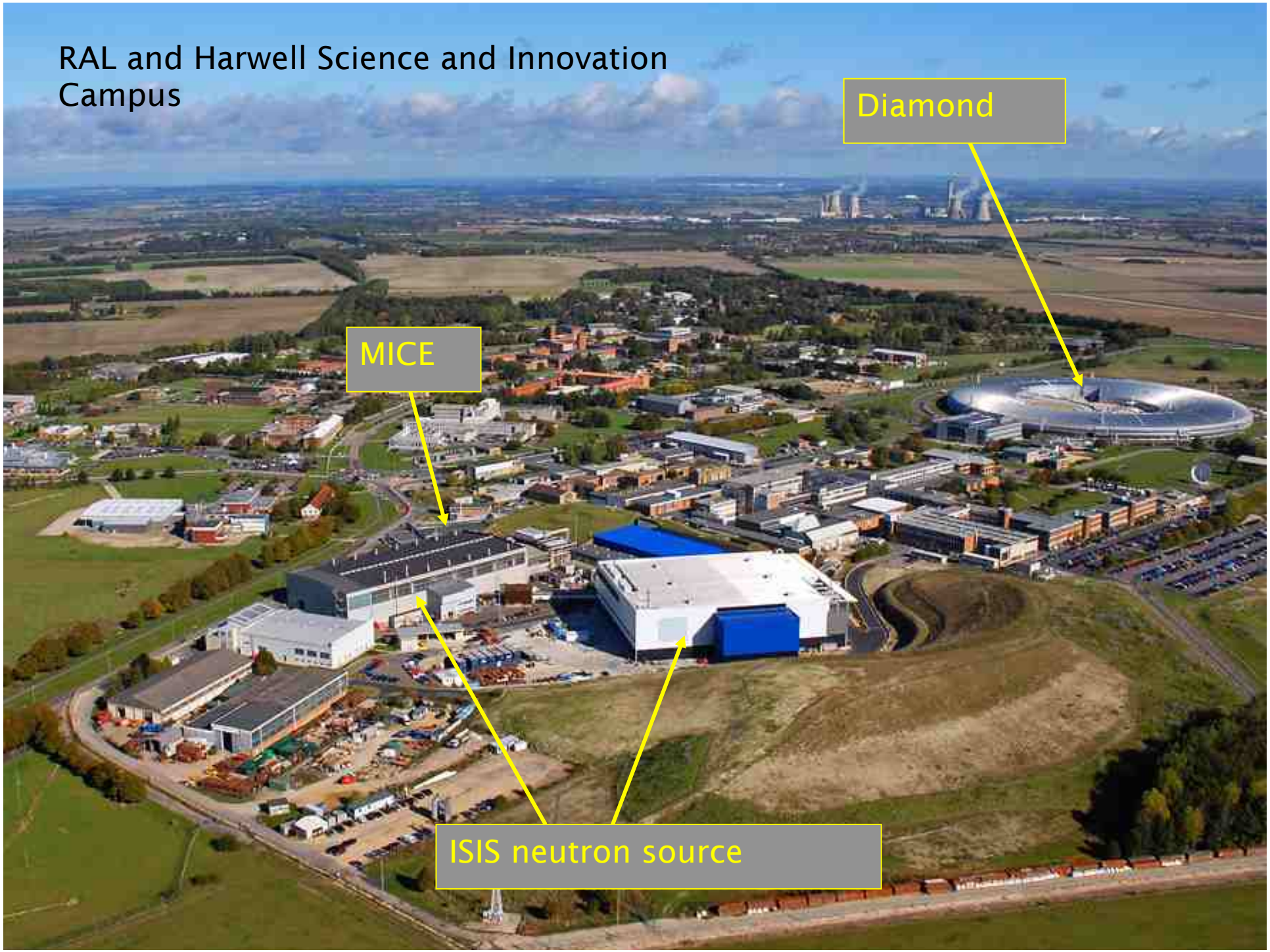
Sci-Tech Daresbury campus


RAL and Harwell Science and Innovation Campus
Diamond
MICE
ISIS neutron source

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Role of the institutes and the labs

The UK has a partnership of universities (through the institutes) and the national labs, connecting with each other and with industry. This gives a collaborative research environment. Staff move in both directions.

Role of the Universities: The core educational and fundamental research agenda of the universities means accelerator research is now also done in the universities. **The universities provide this academic effort and training, giving breadth and increasing scope of the UK accelerator science programme.**
(Universities are also pathways into areas like materials science departments)

Role of STFC, Laboratories and ASTeC: **Labs are large multi-disciplinary sites that bring together large teams to do big science**. Large facilities are generally located in the labs (DL, RAL) and the accelerator centres here operated and upgrade facilities like ISIS, DIAMOND and VELA. R&D is carried out, particularly for future facilities.
In essence the labs provide facilities the universities could not.

We have many jointly supervised students, both with UK and international labs.
-> What is the best way to organise this?

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Universities and accelerator physics I
Assessment and ranking

UK is special case – highly developed assessment process : RAE/REF. (national student survey (more indirect) and league tables). These do not impinge on the labs.

In universities, **all academic staff are judged equally across fields**, and on the basis on

research output (defined next)
teaching contributions
citizenship (committees, outreach etc)

The requirements become tougher as the grade is increased (lecturer, senior lecture / reader, professor), with a higher volume and higher impact of research output for professor over the lower grades.

In terms of research, a recruitment or promotion case would look at the following areas (generalising)

Grant income, over and above institute grants
Publication (h index)
"a scholar with an index of h has published h papers each of which has been cited in other papers at least h times."
Invited talks and other marks of esteem
Up to the end of 2013 – performance in the Research Assessment Exercise REF (more later)

The same criteria are used (broadly speaking) for recruitment of university staff. As well as potential. This would mean a laboratory staff member may find it difficult to compete in terms of journal publication output but other metrics may be used depending on the post (See later)

Universities and accelerator physics II

Comment on h index

Computed by various means (e.g web of science, scopus) and uses citation data to compute the index. May not always pull in IPAC information and IPAC citations. As a result is a unreliable measure for our field.

Comment on impact factors

Impact factors are very often citation based, and a key figure of merit for journals across the university sector. University academics often encouraged to publish in the highest impact factor journal possible. PRST-AB is our main journal, and has IF=1.57. Is this due to citation record of our field? Should this be improved? For comparison, JHEP is 6.22, Phys Rev D is 4.864

Do laboratories in UK favor publication in refereed journals?

A decade ago, labs did not publish very much. This is no longer true, perhaps due to the close link to the accelerator institutes. For example journal publication rates for ASTeC/STFC:
2014 (18) 2013 (31) 2012 (33) 2011 (34) 2010 (14) 2009 (12) 2008 (16) 2007 (24) 2006 (27) 2005 (15) 2004 (22) 2003 (7) 2002 (6) 2001 (3) 2000 (5) 1999 (2) 1998 (1)

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The Research Assessment Exercise

- **The Research Excellence Framework (REF) is the new system for assessing the quality of research in UK higher education institutions. It will be completed at the end of 2014.**

- "The funding bodies (e.g. HEFCE) intend to use the assessment outcomes to inform the selective allocation of their research funding to HEIs, with effect from 2015-16.

- The REF is a process of expert review. HEIs were invited to make submissions in units of assessment. Submissions are being assessed by an expert sub-panel for each unit of assessment, working under the guidance of four main panels. Sub-panels apply a set of generic assessment criteria and level definitions, to produce an overall quality profile for each submission."

- **What this means in that all accelerator academics in the UK submitted their 4 highest impact REF-eligible outputs (papers) for assessment by the REF panels in 2014.**

- **The accelerator physics submissions are being judged identically to all other disciplines - all outputs were judged purely on their content - irrespective of whether, or if, they were published in journals, and irrespective of whether they were conference proceedings or journal papers. This is important for our field!**

- So provided they contained original research and were not reviews they were judged by expert peer reviewers on their content - which of course is a slightly subjective exercise.

- **Statistics on who was entered into the REF are confidential, and we await the outcomes. However it highlights the differing expectations on accelerator scientists in UK labs and universities.**

Education programmes

- All the institutes run training programmes in accelerator physics

- In 2002, before the targeted re-expansion of the UK programme, there were very limited numbers of doctoral students in accelerators in the UK.
  - Rise of < 5 to factor 10 more in a decade (number in a given year)

- **Now the UK has around 60 PhD students**

- **CI : Since 2006 80 total students have been trained or are in training at the CI.** Currently there are 41 students enrolled in the CI postgraduate programme**.**
- **The teaching is done by a mixture of university academic staff and laboratory staff, but driven by the institute academic staff.** Attendance is generally CI students, with some lab staff

- UK students also attend CAS, USPAS, JUAS etc.
  - ? How do we organise our training across Europe ?

- **Strathclyde, Huddersfield, Surrey and Queens Belfast have an EPSRC centre for doctoral training on next generation accelerators. This has funded a lot of PhD students (~48) over 4 years.**

TIARA Education and Training Survey Report

- Reported April 2012, up to the 2011 academic year.
- 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.
- **~260 people in the UK doing accelerator science (3060 across the survey)**
- **Around 200 trainees in UK from 2005-2009 (year averaged), then ~300 in 2010 and 2011. This includes undergraduates and lab staff. Around 60 PhDs in 2011.**
- Source : TIARA report and database http://www.eu-tiara.eu/database/

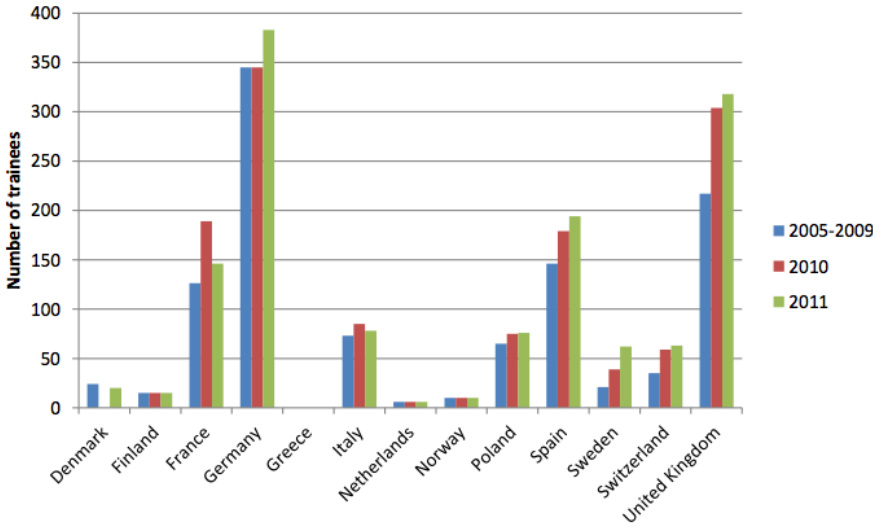
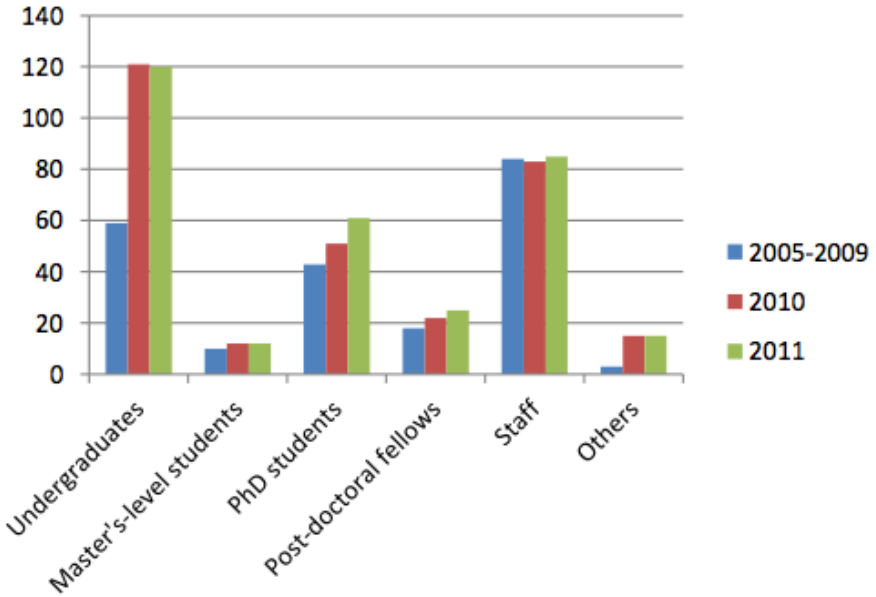


Figure 4.3: The total number of trainees in each country. Data are shown for the academic ye 2011 (green), 2010 (red) and the average per year over the 5 years 2005-2009 (blue).



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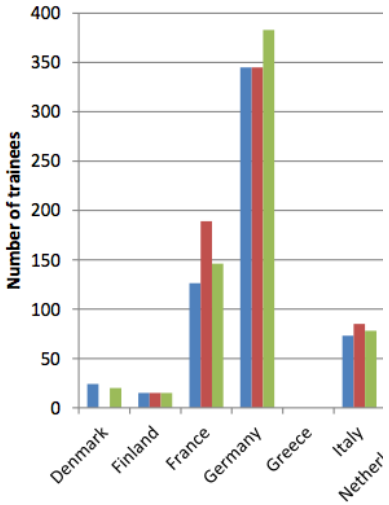

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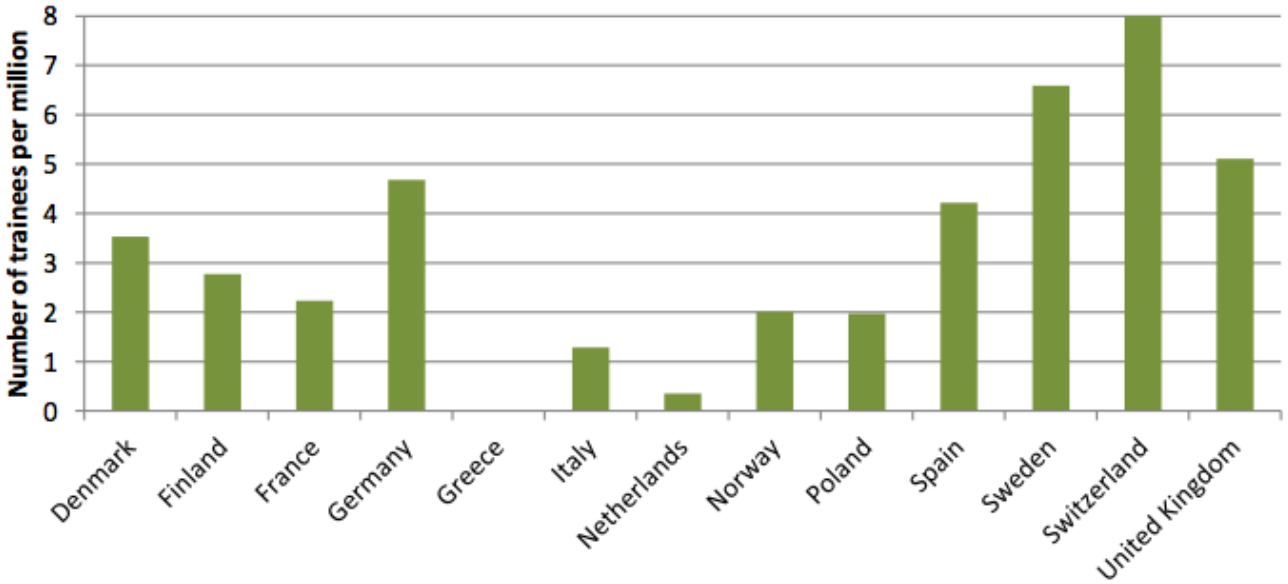

Figure 4.4: The total number of trainees in each country (for academic year 2011) normalised by the population of that country, expressed in trainees per million.

Accelerator physics representation in the Institute of Physics

The Particle Accelerators and Beams (PAB) Group is a subject group in the Institute of Physics (IOP), affiliated to both the Nuclear and Particle Physics Division and the Applied Physics and Technology Division of the Institute.

The IoP has about 50 professional groups, and a total membership of around 50,000.

The group aims to promote the professional standing of workers in the field of particle accelerators, through exposure, events, outreach and increased academic profile.

The Group does this by

- Organising a number of meetings each year, including an Annual Meeting, and topical meetings to aid progress in particular subjects of interest.
  - Recent meetings include 'beams for security' and 'plasma wakefield acceleration"
- Arranging training for new workers in the field in partnership with UK and international bodies
- Awarding several prizes to recognize contribution to the field of particle accelerators, nominated by Group members:
  - An annual Thesis Prize, awarded at the annual Group meeting
  - An award for outstanding contribution to the field by a UK individual
- Publishing a regular newsletter.

There are currently 364 members (0.7%, 88 undergraduates, 38 postgraduates) (by comparison, HEP has ~ 1500, 3%)

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Thank you for your attention

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