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Conference/Workshop Paper

Summary of the 1st EuCAN Workshop ”Universities meet laboratories (ULA2014)”

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CONFERENCE / WORKSHOP PAPER

SUMMARY OF THE 1ST EUCAN WORKSHOP "UNIVERSITIES MEET LABORATORIES (ULA2014)"

SCIENTIFIC NOTE

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Abstract:

The 1st EuCAN workshop ULA2014 illuminated the interplay of universities and laboratories. The workshop took place at the Faculty of Applied Physics of the Goethe-University Frankfurt from 30 September to 1 October 2014. The 40 participants (see Fig. 1) mainly came from European countries. Specifically, the spectrum of participants was as follows –

- France: 3 (CNRS/IN2P3/LAL, CEA, CERN);
- Germany: 15 (DESY, GSI, TUD, Goethe University, Helmholtzinstitut Mainz);
- Italy: 2 (University of Rome, INFN-LNF);
- Japan: 1 (KEK);
- Slovakia: 1 (Slovak University of Technology in Bratislava);
- Spain: 1 (Istituto de Fisica Corpuscular Valencia);
- Sweden: 1 (Uppsala University);
- Switzerland: 9 (CERN, PSI, EPF Lausanne);
- UK: 5 (University of Manchester/Cockcroft Institute, STFC Rutherford Appleton Laboratory, University of Oxford); and
- USA: 1 (MIT/USPAS).

The workshop was composed of the following sessions:

1. Setting the scene: accelerator collaborations and educations;
2. Promoting accelerator research in the academic environment;
3. Accelerator research assessments in different countries;
4. Accelerator research & education in the laboratories;
5. Highlights from EuCARD-2 Networks;
6. Global accelerator training;

The details of the program as well as a collection of all talks are available on the indico web site

https://indico.gsi.de/conferenceDisplay.py?confId=2843

Summary by session

1) ◆The workshop started with a welcome address by the vice-president of Frankfurt University, Enrico Schleiff. In his speech, he emphasized that universities and laboratories are partners of the scientific development and he wished the meeting to become a start of a new forum for discussing the cooperation between these two worlds. ◆This was followed by a talk of the GSI director, Horst Stoecker, who showed that the FAIR project is founded on a strategic cooperation and networking with universities and Helmholtz centers. ◆ The education in the field of accelerator science was discussed, by Phil Burrows of Oxford, starting with the results of the impressive TIARA survey, which revealed an increased need for educating young student in accelerator science. ◆At the European level, accelerator science is also supported through EU co-funded accelerator R&D. At the workshop, the ESGARD Chair, Roy Aleksan, presented an overview of the status and role of the EU Networks, their global coverage, as well as latest activities and plans.
2) ◆ The results of accelerator R&D should be documented in scientific report, conference proceedings, and peer reviewed articles. Frank Zimmermann reviewed the role of PRSTAB and of metric assessments, emphasizing that different communities have different publishing and citing traditions, which affect the impact factors of journal, and, for the accelerator community, keep the PRSTAB impact factor to around 1.5 at present. The impact factor of a journal is the result of the citations to articles published over the two preceding years and the citation culture in the accelerator community is poor. 30% of all published papers have no citations. ◆A different way to promote accelerator studies is also through conference proceedings. The EPS-AG supervises this activity, Gianluigi Arduini reported on these activities. The EPS-AG also provides grants to students for participating in IPACs. The EPS-AG has faced the issue of bibliometric data and issued a statement to avoid too great a disadvantage of the accelerator experts working at universities. ◆Holger Podlech reported the training of students for the accelerator markets at the IAP with a statistics from the last 10 years. The IAP training ranges from lectures, over seminars to the organization of schools. This comprehensive training has resulted in 45 doctoral theses in the accelerator field at Frankfurt's IAP PhD during the past 10 years. The training also includes laboratory courses, e.g. with RF cavities, ion sources, etc.
3) The third session reviewed the accelerator research in different countries. ◆In Italy the accelerator community consists of about 240 persons, of

whom only around 10 are located at universities. Accelerator training is possible in several universities; Roma La Sapienza offers a doctorate in Accelerator Physics. Mauro Migliorati reported difficulties in the procedure for evaluating the quality of the accelerator research: JACoW proceedings are not recognized as a scientific production and are discarded in universities posts, limiting the career prospects of accelerator physicists. ◆The situation in Germany reveals the complexity of this country's research system with universities having professorships in common with laboratories. TU-Dortmund, FWU, JGU-Frankfurt, TU-Darmstadt, JGU-Mainz are exceptions because they have, and operate, their own accelerators. Helmholtz-centers (GSI/FAIR, DESY, etc.), reported Kurt Aulenbacher, rely on the flow of young researches from universities, and hence would profit from a better connection with universities, leaving aside the issue of the assessments of accelerator physics. Accelerator physics lacks of "respectability" in universities; there is a bad publication habits (leading to journals with low impact factor); component development is often considered engineering work. In addition university facilities are very difficult to maintain and keep competitive. ◆In Switzerland the majority of the PhD students are related to CERN (LHC). As shown by Lenny Rivkin, the synergy between universities and PSI or CERN seems to work well. ◆ The UK accelerator program is rich, featuring many facilities and ongoing experiments. Rob Appleby showed that the main institutes pursuing R&D are ASTeC, CI and JAI; R&D is pursued both at overseas and domestic test facilities, for example at MICE. Training is provided to students and staff by CI, JAI and several other universities. Presently in the UK there are around 60 PhD students. University staff is judged by its research output, teaching contributions, and distinction. The research is evaluated by looking at grant income, h-index, and invited talks. UK laboratories support publications in refereed journals. ◆Angeles Faus-Golfe reported that in Spain accelerator research at facilities and laboratories is being coordinated and supported in the frame of CONECTA. Universities provide master, and accelerator physics courses, which were mainly focused on ESS (Bilbao), ALBA-CELLS, and CIEMAT. The main universities involved are UAB, UPC, etc. The bibliometric data assessment for promotion at Spanish universities requires 5 publications in refereed journal with high impact factor (PRSTAB being insufficient). The strict and blind implementation of this policy prevents the further establishment of accelerator physics as a discipline at universities. Other institutions in Spain have their own rules. Conference proceedings are useful, but in general peer-reviewed publications should be pursued in order to increase possibilities. ◆Philip Bambade summarized the situation in France. Most accelerator activities here fall under responsibilities of CNRS/IN2P3 and CEA/IRFU, which are operating GANIL; ESRF, and SOLEIL are run by civil companies. The majority of the personnel belong to a category called research engineers. Hiring of researchers, lecturers, or professors proceeds at the rate of about 1/year. However, the recruitment process of academic staff is subject to criticism because a candidate has little competition (only few candidates are applying to accelerator posts). Attempts to increase the pool of appropriately trained candidates is limited by the difficulty in attracting top--level doctoral students, except sometimes from abroad, even though there are excellent opportunities in SOLEIL, ESRF, GANIL and in some of the university R&D activities. Defining jointly supervised doctoral projects with large laboratories in the context of real cooperation is considered important and mutually beneficial. ◆Volker Ziemann reported that in Sweden the accelerators are located in Uppsala (TSL, FREIA), Stockholm (MSL), and Lund (Maxlab, ESS). Initially accelerators were operated by universities. In 2003 two major laboratories were closed, and in 2009 the ESS was started. At Uppsala a program of accelerator education comprises about 10 students/year including 3 doctoral students. In Stockholm the education involves around ~8 students, who can be active at DESIREE, as well as in (international) projects with in-kind contributions Lund has ~10 students including 5 doctoral students in the field of accelerators. Study and work opportunities exist at MAX I, II, III, MAX IV. ESS hosts 25-35 PhD, and master students, and has collaborations with both Uppsala and Lund University. In Sweden synergies between labs and universities clearly exist and are exploited to mutual benefit. ◆ Japan has 3 big laboratories: KEK, RIKEN, JAEA, as reviewed by Susumu Kamada. In addition accelerator laboratories at universities include cyclotrons, tandems, light sources, Beam Cooling FFAGs, etc. Other accelerator infrastructures belong to NIRS, such as cancer therapy machines, and production of medical RI. The funding agency is the MEXT ministry. The academic part of MEXT (formerly Mombusho) has founded the inter-university research institute corporation. The SOKENDAI organization was established to enable a postgraduate program. At the moment 9 students out of a total of 100 in the school of High Energy Accelerator Science belong to the department of accelerator science. In Japan accelerator physics has its own society PASJ and also the Japanese Beam Physics Club. Beam Physics is recognized in the PTEP Journal with its own section. ◆In Slovakia there exist 30 universities, and 3 laboratories are involved in material science and engineering using ion beams, material science using electron beams, and isotope production. Márius Pavlovič reported about two new laboratories under construction. There are 2 laboratories attached to universities, and one more is under construction. The strategy of financing the educational institutions is based on the number of students, which decreases the quality because teachers are forced to be more tolerant. Students seem to avoid accelerator physics in favor of easier disciplines, while the more talented students go abroad.

4) ◆The session on accelerator research & education in laboratories started with the presentation of Joachim Stroth on the HIC for FAIR initiative. The excellence initiative of the State of Hessen has supported institutes and universities through a competitive program investing 430 M€ between 2008-2013. The HIC for FAIR mandate is to strengthen university groups working on FAIR related physics and instrumentation. The initiative concerns Theory, Experiment, and Instrumentation (accelerator fall in this latter category). The main support of HIC4FAIR is for experimental nuclear physics related activities: PANDA, CBM, NUSTAR, and APPA. Accelerator development and high performance computing appear as well. Partners of HIC4FAIR are JLU Giessen, GU Frankfurt, FIAS, TU Darmstadt, and the GSI/FAIR/ Helmholtz Gemeinschaft. HIC4FAIR was built up in 2008-2011 and reaches a stable activity in 2014-2016. HIC4FAIR is one of the 3 pillars of cooperation with FAIR; the other two are EMMI (interdisciplinary research) and HGS-HIRe (education of PhD students). From 2008 to 2013 HIC4FAIR hired 27 LOEWE professors (23 M, 4F) with a total of ~3 professors in accelerator physics and technology (~11%) on joint appointments. From 2010 the actual number of PhD students supported by HIC4FAIR amounts to ~120. The accelerator activities in Germany are also supported at the federal level. ◆Another initiative in Germany is pursued by the KfB (400 members), which has gained a position inside the DPG since 2014, as reported by Oliver Boine-Frankenheim. The DPG has 63,000 members, at least 80 of whom are in accelerator physics. In Germany there over 1000 accelerator physicists and engineers in Germany as well as about 180 PhD students in accelerators and related fields. A collaborative research is being pursued through the BMBF funding for accelerator physics ("Verbundforschung"). Presently the state of Hessen has 22 BMBF-supported projects out of a total of 59. A sum of 186 M€ is invested in high-energy physics, condensed matter, and nuclear physics through these programs. The share for R&D in accelerator is about 7.5%.

The gal of the KfB is to establish accelerator science as an interdisciplinary research topic, and to render accelerator physics and engineering even more attractive for young talents. ◆ An example of the interplay between universities and laboratories is reported by Alan Letchford for the Front End Test Stand at RAL. At the beginning this project was purely managed by RAL, but the intention was to encourage R&D activities in UK university groups and to strengthen the collaboration between RAL and those groups. This aim was achieved very successfully, and universities have become an integral part of, and full stakeholders, in the FETS project, while RAL experts lecture in university courses. Universities and the laboratory now manage FETS jointly. Although with some difference in attitude the UK experience is a great success. ◆ With regard to new concepts, Ralph Assmann demonstrated how Novel Accelerator R&D explores future possibilities for accelerators. One goal is to reach beam energy of Multi-GeV laser-driven and plasma acceleration. Acceleration lengths are 100-1000 times shorter with no fundamental limit in sight. Long term applications are: 1) a compact linear collider that promise e+e- up to 3TeV with a plasma linear collider (5 km length), and 2) Laser-driven compact X-ray FEL. The EuPRAXIA (European Plasma Research Accelerator with eXcellence In Applications) proposal has been prepared and submitted in the framework of H2020. Also in Germany, the Research Field Matter is a new program, with a section in Matter and Technologies, which has a branch in Accelerator Research and Development (ARD). The latter contains a rich program in SC RF Technology (to CW), e- plasma accelerator, and p/ion plasma accelerators. In this program universities are included as external partners with work package responsibility. In Hamburg two main projects are progressing, SINBAD, and the Hamburg plasma collaboration LAOLA.

5) In the section on highlights from EuCARD2 Networks a series of talk was given on the status of the various networking activities: WP2 Catalyzing Innovation, WP3 EnergyEfficient, WP4 Accelerator Beams, WP5 Extreme Beams, WP6 Low Emittance Ring, and WP7 Novel Accelerators.
6) ◆The training of students is an important aspect of the future of accelerator R&D. Bill Barletta reported that the USPAS represents a partnership of 7 DOE/SC laboratories (FNAL, ANL, BNL, JLAB, LBNL, ORNL, SLAC), 1 NNSA laboratory (LANL), and 2 NSF funded universities (Cornell, MSU). The US Particle Accelerator School provides graduate-level educational courses in the science of beams & their associated accelerator technologies. National Laboratories cover all the

costs of the USPAS program. The *average contribution is now >90 k$ per year*. Only Maryland, Cornell, MSU, UCLA, & Stanford have strong faculty lines (>2 professors) but all others do not have any strong graduate programs. Typical attendance per school is ~ 145 students. All topics are covered by USPAS. Schools are held at a hotel, with USPAS providing breakfast, dinner, and textbooks. The basic courses are attracting more students (e.g. on accelerator fundamentals, beam physics, microwave measurements). 60% of the students take USPAS for credit, and at the end of the school a feedback is provided to both instructors and students: 55% of the instructors are excellent, and 42% of the courses are excellent. USPAS has a degree program: Master of Science in Beam Physics and Accelerator Technology, Indiana University & USPAS. In parallel ODU, Stony Brook, MSU, MIT, Cornell, U. Chicago are increasing their portfolios of accelerator courses. ODU also is in the process of establishing a USPAS-affiliated Ph.D. ◆ Alessandra Valloni highlighted that the support of students is fundamental and, in this respect, the Marie Curie Training Network provides mobility research grants. In particular the oPAC branch provides grants and training on the topic of "Optimization and performance of any Particle Accelerator". The oPAC network is composed of 30 partners and has a total budget of 6M€. The working packages are on beam physics, beam diagnostics, simulation tools, and control systems. The OPAC training is made through the schools CAS and JUAS, as well as through complementary oPAC schools. oPAC also organizes topical workshops on specific topics. Student participation in the OPAC program are reviewed, and the results of their projects are disseminated through brochures, CERN Bulletin, oPAC newsletters and social networking. ◆ Training of students at laboratories was reported from CERN by Stephan Russenschuck. The technical and doctoral program at CERN involves a large number of students (of order 600). The program covers the fields of physics, engineering, and computing. The selection of applications takes place 2 times a year (May, November). CERN provides a summer student program and the technical student program offers 140 position/year. The PhD program includes ~60 positions/year. The actual trend shows an increase of the technical and PhD students at CERN over the last years. The selection of the students is made via a technical and doctoral student committee. The Austrian doctoral student program, and the Wolfgang Gentner Program provide major grants for students from Austria and Germany, respectively. A system of evaluation of the PhD and supervisors provides a comprehensive database for feedback and improvement. ◆ Werner Herr reported that the mandate of CAS, founded in 1983, is "To preserve and transmit knowledge accumulated, at CERN and elsewhere, on particle accelerators and collider of all kinds". CAS is financed through the fees of participants and not by governments or universities. The various CAS schools take place in the member states of CERN. There are introductory and advanced schools, as well as topical schools responding to specific training demands in the accelerator community. Typically a residential school extends over 2 weeks. The topics covered include all aspects of accelerators. The CAS management responds directly to the CERN directorate and CERN DG. An advisory committee contributes to the improvement of the school, and to the selection of lecturers. All lecturers are invited on a personal basis and for a general school about 50% are from CERN, and 10% from Universities. For topical schools ~50% of the lecturers are from non-CERN laboratories. At the introductory level the school has of the order of 120 participants, while for a topical school about 80 participants are typical. 80% of the students are from laboratories and ~17% from universities. The school has an evaluation system for lecturers. Average scores are ~ 4/5. The school has produced 36 proceedings, all of which available online. CAS focuses on training laboratory staff and has no direct link to universities. Presently CAS is making an effort to promote teaching of contemporary beam dynamics. ◆ Training of students is also provided by the JUAS, as discussed by Louis Rinolfi. Since 1994 JUAS has trained more than 800 students and had 122 lecturers. 15 European Laboratories supervise JUAS. JUAS offers 2 courses each year of 116 hours each, with comprehensive lectures tutorials, and seminars. Students here come from a broad range of countries (18 countries in 2014). An evaluation system helps maintaining the quality of lectures and tutorials. The JUAS has organized visits at CERN (CLIC CTF3, CMS, Linac 3, LEIR), as well as to ESRF, PSI, and HUG (University Hospital of Geneva). The training has also included a "practical day at CERN", and a "practical day at BERGOZ". The students afterwards produce reports on their practical experience. At the end of the courses students pass an examination and if they succeed, they receive ECTS credits recognized by the European partner universities, and a certificate is provided as well.

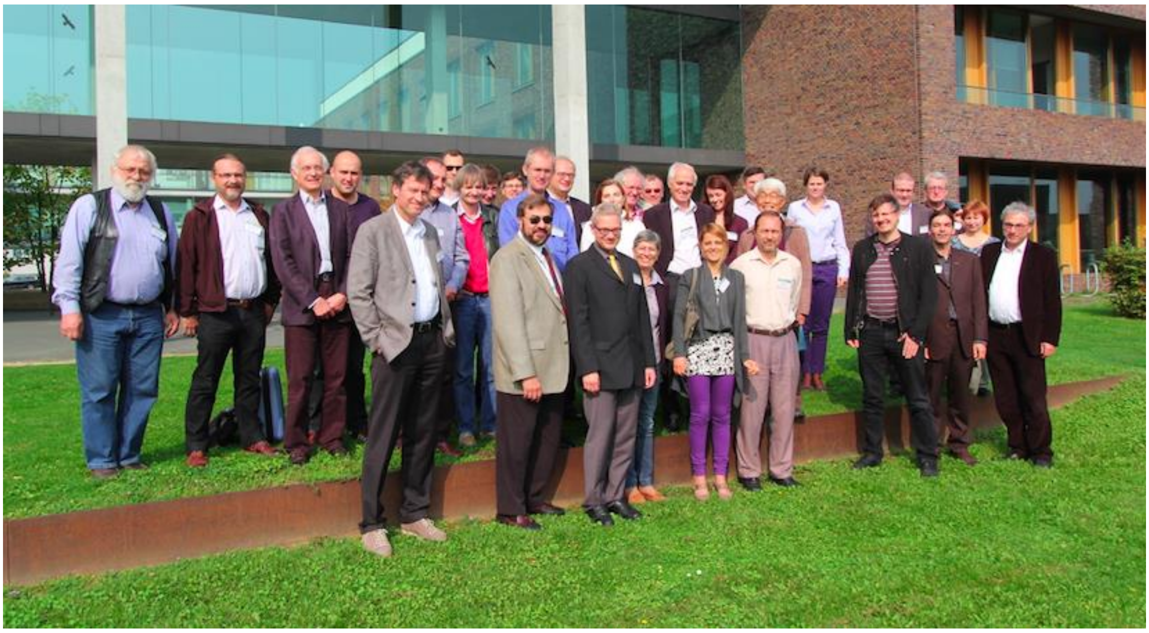

Figure 1: Some of the ULA2014 participants in front of the Institute of Applied Physics, Goethe-University Frankfurt am Main
(Credits: Fips Schneider, IAP, U. Frankfurt).

Global Summary

"Universities meet Laboratories" was a pioneering attempt to bring together representatives of the academic world and of laboratories, in order to confront the interface of joint research, communication and collaborations.

The workshop revealed a unanimous consensus among the participants from universities across Europe that, in general, the field of accelerator physics and technology appears to be often disadvantaged by an inadequate standing in the academic environment.

This perception diffuses down to the students many of whom then do not choose accelerator physics as university study topic. Most students are not even aware of accelerator physics as a possible career path. Greater efforts should be made to attract students in the first stage of their studies.

Joint PhD supervision is not an easy process: the needs of the laboratories do not always match with the university research interest. This issue was raised in the discussions by several workshop participants (e.g. in relation with CERN joint supervision of students).

In terms of research assessments the workshop has evidenced a distinct difference of the research evaluation at universities and laboratories. This difference does not only prevent some laboratory staff from competing for job posts at universities, but it also renders collaboration with laboratories less attractive for the university staff. One reason is that laboratories traditionally disseminate their work in conference proceedings (if at all), while the universities consider only the publications in peer-reviewed journals.

Some universities apply metric evaluation criteria like the h-factor too strictly without taking into account specific aspects of accelerator physics and ignoring other relevant scientific outputs. In some countries, like Spain, the academic evaluation even includes only publications in journals with high impact factor.

In fact, the workshop has underlined that accelerator physics journals are suffering from a low impact factor, which is becoming a discriminating element in the research evaluation.

The workshop has also highlighted the impact of three major European and American accelerator schools – CERN Accelerator School (CAS), and Joint Universities Accelerator School (JUAS), and US Particle Accelerator School (USPAS) – as well as accelerator training at universities, with Germany leading the way. In Japan the combination of the Graduate University for Advanced Studies (SOKENDAI) and the Inter-University Research Institute Corporation has proven effective.

The TIARA survey report showed that the many ongoing activities require more training in accelerators.

In most of the European countries the elevation of the discipline to the same as level as other, more established branches of physics is being pursued by self-organization of the community (e.g. KfB in Germany, CONECTA in Spain), and with the support of the EPS-AG.

Good experience with joint research, and including green field academic accelerator studies, has been reported from UK, but the overall situation remains complex, with several participants suggesting the need for a deeper discussion of these subjects.

A key to attractiveness, particularly for students, can be the multi/inter-disciplinary character of accelerator science. This aspect could further be promoted in the future.

Another advantage of the discipline, compared to fields like HEP or even nuclear physics, is that accelerator scientists can be both theorists and experimentalists at the same time. Such comprehensive research activity is rarely possible in any other branch of pure subatomic physics.

With the evolution towards smaller, very sophisticated, accelerators, another possible path is a closer connection between the accelerator scientists and the users, through approaches integrating these two communities. At LAL, with the new ThomX facility, work is ongoing in this direction.

Finally, some subfields of accelerator science have an atypical, exceptionally high academic standing. For example, in the field of novel acceleration methods (laser plasma, etc...) researchers often publish in excellent journals attract substantial funding. What can be learnt from that community?