

Joint Learning at CANDLE

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On initiative of the University Hamburg an experimental training course on accelerator physics will take place in late summer 2019 at the CANDLE institute in Yerevan for which students from Hamburg will travel to Armenia. The idea for this course came to Jörg Roßbach, retired professor at the Universität Hamburg, during a visit of the CANDLE institute on occasion of a workshop in 2017.

The CANDLE institute¹ was founded in 2002 with the aim to construct accelerator based radiation sources for broad applications in science (e. g. struktural biology and material sciences) in order to sustain the high level of Armenian science and to strengthen it for future tasks. CANDLE, as well as the Yerevan Physics Institute YerPhI, maintain close cooperation with the Hamburg based Deutsches Elektronen-Synchrotron DESY², as well as with the Universität Hamburg³ which date back to the 1960s (ADK 2016, Issue 2). Especially the last years witnessed a strong and positive development of the CANDLE institute. Meanwhile not only the modern accelerator AREAL is in operation for the production of ultra-short electron bunches, also a two-photon microscope and a micro-fabrication facility are functioning and are being used for experiments. In parallel, various laboratories and workshops equipped with modern infrastructure are made available for the preparation and the design of experiments. In the running experiments very short electron pulses are used to irradiate samples to induce for example changes of electrical material properties or in case of biological samples damage of DNA. Especially the investigation of repair mechanisms of DNA damage has led to new insights. Following international practice CANLDE is operated as user facility, i.e. AREAL, laboratories, and workshops are freely available for experiments of scientist from Armenia and abroad. In parallel to the daily operation also the upgrade of the facility is pursued. The experimental possibilities will be greatly enhanced with an increased energy and the installation of a so-called free-electron laser, which will bring CANDLE also on par with the international field. The CANDLE institute is seeking further support of its activities for example with a proposal submitted to the European Union within the Horizon 2020 framework which will be decided in spring.

The environment is ideally suited for the education of students and thus can contribute to the long-term consolidation of the cooperation between CANDLE and Universität Hamburg.

‘This is a completely new kind of cooperation which aims at strengthening and developing the educational and the research capabilities at the Universität Hamburg as well as at the participating Armenian universities in the area of modern accelerator physics. Students will get access to a world-class infrastructure at the CANDLE institute which allows modern experimental research.’ explains Prof. Roßbach. ‘We are cooperating with the CANDLE institute in Armenia already for a long time, but until now our contacts have been related to research projects. Today our task is to prepare students of general physics, high-energy physics and accelerator physics for working with state-of-the-art scientific equipment. To this end we have developed a special educational program which will become part of the academic training. The necessary basis for this course is available; with the construction of the AREAL facility also the appropriate infrastructure has been set up. We have no comparable equipment as at the CANDLE institute in Armenia available for the education of students in Hamburg. We are confident that, thanks to the new course, our students will receive a training which meets the requirements of physical institutions at highest level. Moreover it is important to us, that the program goes beyond the frame of scientific and educational cooperation. Therefore the experiments will be conducted in small groups in which Armenian and German students work together. Becoming acquainted with each other, exchanging ideas and experiences and the contact with the Armenian culture and society during the one-week stay are steps for expanding and strengthen the cultural ties between

¹ <http://candle.am/>

² <http://www.desy.de/>

³ <https://www.uni-hamburg.de/en.html>

Germany and Armenia.’ The first course with students from Hamburg will be held end of September /beginning of October 2019.

The ‘Joint German-Armenian Practical Course’ is supported by the German Federal Ministry of Foreign Affairs in the framework of the program ‘Expanding Cooperation with Civil Societies in the Eastern Partnership Countries and Russia’ initially for two years. A first preparatory meeting in Yerevan in December last year⁴ gave opportunity to talk to the dean of the faculty of physics of the Yerevan State University, and with representatives of the State Committee of Science of Armenia (SCS)⁵.

‘The broad political support of our initiative and the integration into the scientific institutions in both countries is very important for us.’ explains Prof. Wolfgang Hillert from Universität Hamburg. ‘All our dialogue partners rate our initiative positive and appreciate it as a future oriented program. Especially the mutual benefit for the development of educational programs and new outlooks in the cooperation were highlighted. With the granted two-year financial support of the ministry of foreign affairs we have now the possibility to implement the program and gain first experience. We hope, of course, that we can perpetuate the financial support in the coming years.’

At the meeting in December the sequence of experiments, necessary instruments and such were discussed with the experts at CANDLE. Especially the composition of the written, concomitant material for the experiments was detailed with respect to depth and length. With the aim to be accepted as part of the standard academic training at Universität Hamburg and various Armenian universities (e. g. Yerevan State University, Yerevan Engineering University), which means that the students shall get credit points for the training, the practical course has to meet highest requirements.

‘After I got acquainted with the level of research at the CANDLE institute and the available experimental equipment, I’m convinced that the program developed by us will meet the requirements not only at Universität Hamburg.’ summarizes Prof. Hillert the preparatory meeting. ‘This initiative opens great possibilities to prepare a new generation of scientist in an international team for the future and to strengthen the educational possibilities in Armenia and in Hamburg.’

At this point another initiative of the CANDLE institute to improve the education of young scientists shall be mentioned. Already in July a Memorandum of Understanding was signed between CANDLE and the German high-tech company Rohde & Schwarz⁶. Rohde & Schwarz is a leading company in the field of measurement equipment, information technology and IT-safety. The aim of the initiative is to set up a training centre for education in the area of electronics, telecommunication, microwave technology and control systems for accelerators at CANDLE. Rohde & Schwarz supports the centre by providing free educational material and by discounts for measurement equipment.

The opening of the training centre is foreseen for July 2019 in conjunction with the international workshop ‘Ultrafast Beams and Applications - UBA 19’⁷. With these educational initiatives CANDLE opens a new page in its history. The high requirements in the field of accelerator physics and accelerator applications cover a wide spectrum of physical and technological questions, so that the initiatives will outreach into other institutions, into the educational activities at the universities and thus into the Armenian society. The development of prospects for a future in Armenia through international networking is particularly important for young Armenian academics. Giving young people the possibility of a high-level education in an international environment is thus an indispensable investment into the future which will soon show positive results.

⁴ <http://candle.am/german-armenian-joint-course/>

⁵ <http://www.scs.am/en/305c0675f29a59c931952744>

⁶ <http://candle.am/mou-between-rohde-schwarz-int-gmbh-and-candle/>

⁷ <http://candle.am/uba19/>

The Authors

Dr. Klaus Floettmann studied physics at Universität Hamburg. He took over responsibility in various accelerator projects at DESY, predominately in the area of developments of new particle sources. Since 2010 he supports the construction of the linear accelerator at CANDLE, among others as member of an international advisory committee.

Prof. Dr. Vasili Tsakanov studied physics at Rostov on Don State University. After a 2 years guest stay at Technische Universität Darmstadt he headed since 1998 the division of accelerator based radiation sources at YerPhi and was from 2002 on technical director, and from 2005 on director, of the CANDLE institute.



Discussion of the training course during the preparatory meeting in December. In the first row Prof. Wolfgang Hillert (left), Prof. Jörg Roßbach (middle) and Dr. Velizar Miltchev (right) from Universität Hamburg.



Participants of the preparatory meeting examine high-precise accelerator components which have been produced in the workshop at CANDLE.