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An exciting year is coming to its end

Essentially all parts of the brand-new **ELENA** ring at CERN have now been installed and baked. Commissioning with beam started in 2016 and will be resumed in early 2017, only interrupted for the installation of the electron cooler some time in spring. ELENA will then be ready from 2017 to provide beam to the GBAR experiment. This will be the start into a whole new world of low energy antimatter physics.

At the same time commissioning of the **CRYRING@ESR** has started since summer 2016. A local ion source with 300 keV/u RFQ accelerator, as well as the injector beamline from ESR to CRYRING are all operating and have both successfully demonstrated ion beam transport to CRYRING. A first turn of H^{2+} ions injected from the local injector into CRYRING was demonstrated in October/November 2016.

Thus the future for studies with low energy beams looks very good indeed and on this basis we would like to wish everyone in the antimatter community a wonderful Christmas time and good start into 2017!

Carsten, Thomas and Jochen

News from FAIR

International shareholders approve construction project execution plan. The path from the scientific idea for the future accelerator centre FAIR (Facility for Antiproton and Ion Research) via the preparations for civil construction up to the realization of one of the most modern research facilities in the world is taking tangible shape. The international shareholders of FAIR as well as the supervisory board of *GSI Helmholtzzentrum für Schwerionenforschung* have agreed on significant benchmarks for the future project execution plan in their recent meetings in Darmstadt. The nine partner countries funding the large-scale research infrastructure alongside Germany expressed their full support for the construction project execution plan as well as for the concrete elaboration of the scientific program planned for FAIR by the experiment collaborations. This also includes the progresses in the technical development and the realization of detector components for the experiments.



Characterizing an antiproton beam – without touching it

A precise measurement of absolute beam intensity is essential for many experiments. It is a key parameter to monitor losses in a beam and to calibrate the absolute number of particles delivered to the experiments. However, this type of measurement is very challenging with traditional beam current diagnostics when it comes to low energy, low intensity beams as they are found in the AD due to the very low signal levels.

Miguel Fernandes and colleagues from CERN, GSI, Helmholtz Centre Jena and the University of Liverpool have now experimentally demonstrated a new type of monitor. A precise measurement of the beam intensity in the AD is essential to monitor any losses during the deceleration and cooling phases of the AD cycle, and to calibrate the absolute number of particles delivered to the experiments.

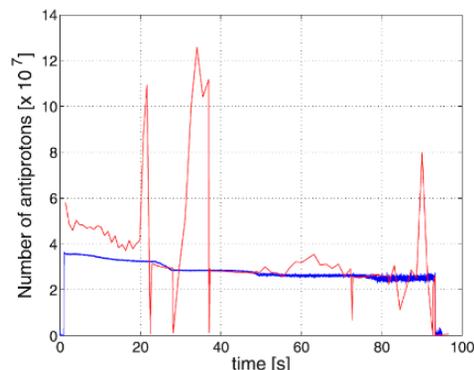
However, this is rather challenging with traditional beam current diagnostics due to the low intensity of the antiproton beam which is of the order of 10^7 particles, corresponding to beam currents as low as a few hundred nano-Amperes. To cope with this, a Cryogenic Current Comparator (CCC) based on a Superconducting QUantum Interference Device (SQUID) was developed and installed in the AD.

Previous incarnations of CCC's for accelerators suffered from issues concerning sensitivity to mechanical vibrations and electromagnetic perturbations. Furthermore, these setups were used for measuring slow beams, usually from transfer lines of accelerators, and were unable to measure short bunched beams presenting fast current variations.

Further information:

M. Fernandes, et al., Non-perturbative measurement of low-intensity charged particle beams, *Superconductor Science and Technology*, Volume 30, Number 1 (2016).

<http://dx.doi.org/10.1088/0953-2048/30/1/015001>



Measurement of the number of antiprotons during an AD cycle. In blue is shown the measurement from the new CCC device, and in red is the measurement from the existing monitor based on the analysis of the beam Schottky noise.

In order to measure the beam current and intensity throughout the cycle of a synchrotron machine such as the AD, the CCC needed to be adapted to cope with the fast signals of bunched beams.

In an open access paper just published in the IOP “Superconducting Science and Technology” journal, Miguel Fernandes and co-authors describe the challenges of implementation and first beam measurements.

These are the first-ever CCC beam current measurements performed in a synchrotron using both coasting and short bunched beams. The paper demonstrates the exciting prospects of this new type of beam diagnostics device.

SPARC Topical Workshop

16th -20th September 2016, Krakow, Poland



Following on from the successful tests which mark the beginning of the commissioning of the Crying accelerator into the Facility for Antiproton and Ion Research (FAIR) at GSI, there was much to discuss at the annual Stored Particle Atomic Research Collaboration (SPARC) meeting at the Jagiellonian University, Krakow, Poland.



When fully commissioned, FAIR will be one of the most intricate and sophisticated accelerator chains in the world allowing science to be performed in nuclear, plasma and condensed matter physics.

SPARC which falls under one of the four pillars of GSI, Atomic, Plasma Physics and Applications (APPA), will perform experiments into dynamics in strong electro-magnetic fields and fundamental interactions between electrons and heavy nuclei.

Talks at the workshop covered diverse areas including machine performance, interstellar chemistry and spectroscopy experiments and gave a glimpse into the exciting experiments which will begin in 2018 when FAIR starts.

The Facility for Low-Energy Antiproton and Heavy Ion Research (FLAIR) also falls under the APPA pillar and will allow experiments to be performed into fundamental anti-matter physics utilizing the FAIR facility.

Development of FLAIR into FAIR is some years away, however, good science is rooted in preparation. This is true of not just scientific equipment but scientists themselves.

This is where the new innovative training network Accelerators Validating Antimatter Physics (AVA) steps in which was introduced at the SPARC workshop by Dr. Lee Devlin from the University of Liverpool/Cockcroft Institute to keep the community aware of ongoing developments. AVA will train the next generation of scientists in both accelerator and antimatter physics in preparation for future and current experiments at FLAIR and elsewhere around the world and will bring both communities closer together through schools and topical workshops.



Further information:

Workshop website: <http://www.sparc2016.if.uj.edu.pl/index.php>

Precision Physics, Quantum Electrodynamics & Fundamental Interactions

An international conference will be held between April 30th to May 5th 2017 in Cargese, France, organized by Wolfgang Quint and Manuel Vogel (GSI and Helmholtz-Institute Jena) and Laurent Hilico and Jean-Philippe Karr (Laboratoire Kastler Brossel Paris and Université d'Évry-Val-d'Essonne).

The conference will bring together scientists in both experimental and theoretical physics from the fields of precision physics, particle trapping, the physics

of simple atomic systems, strong-field physics, quantum electrodynamics and fundamental constants, interactions and symmetries.

The program consists of oral contributions of up to 40 minutes in lengths, as well as posters. Early career researchers are particularly encouraged to contribute.

Further information can be found at: <http://indico.gsi.de/event/cargese2017>

FFK2017 announced

The International Conference on Precision Physics and Fundamental Physical Constants (FFK), will take place on May 15th -19th 2017, at the University of Warsaw, Poland.

The Conference follows the conference and series of workshops on Precision Physics and Fundamental Physical Constants (2008-2015) which took place in Budapest (Hungary), St. Petersburg (Russia), Stará Lesná (Slovakia) and Dubna (Russia).

The event is organized by the Faculty of Physics UW and is endorsed by the CODATA Task Group on Fundamental Constants.

Main topics include:

- Fundamental physical constants
- Precision measurements in atomic and molecular physics
- Precision measurements in low energy particle physics and astrophysics
- Precision tests of fundamental interaction theories
- Exotic atoms

More information can be found here: <http://ffk2017.fuw.edu.pl/>

**FFK
2017**

**International Conference on Precision Physics
and Fundamental Physical Constants**



**15-19.05
2017**

Faculty of Physics, University of Warsaw
<http://ffk2017.fuw.edu.pl>

Conference Topics

- Fundamental physical constants
- Precision measurements in atomic and molecular physics
- Precision measurements in low energy particle physics and astrophysics
- Precision tests of fundamental interaction theories
- Exotic atoms

Speakers

Sonia Bacca (TRIUMF), Jan C. Bernauer (MIT), Dmitry Budker (Berkeley), Ali Eichenberg (METAS), Kield Elkema (VUA), Eric Hessels (York), Bogumil Jezziorski (Warsaw), Jacek Komasa (AMU), Edmund Myers (FSU), Rndolf Pohl (MPQ), Jonathan Sapirstein (Notre Dame), Vladimir Shabaev (St. Petersburg), Sven Sturm (MPIK), Peter G. Thirolf (LMU), Wim Vassen (VUA), Jochen Walz (Mainz), Meng Wang (IOMP CAS), ...

Scientific Organizers

Andrzej Czarniecki (University of Alberta, Edmonton, Canada)
 Simon I. Eidelman (Budker Institute of Nuclear Physics, Novosibirsk, Russia)
 Victor V. Flambaum (University of New South Wales, Sydney, Australia)
 Michal Hnatik (Safarik University, Kosice, Slovakia & JINR, Dubna, Russia)
 Masaki Hori (MPQ Munich, Germany & U. Tokyo, Japan)
 Dezső Horváth (Wigner Research Centre for Physics, Budapest, Hungary)
 Saveliy G. Karshenboim (MPQ Munich, Germany & Pulkovo Observatory, Russia), co-chairman
 Vladimir I. Korobov (JINR, Dubna, Russia)
 Estefania de Mirandes (BIPM, Sèvres, France)
 Krzysztof Pachucki (University of Warsaw, Poland), co-chairman
 Vladimir Shabaev (St. Petersburg State University, Russia)
 Eberhard Widmann (SMI, Vienna, Austria)



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Summer student Program at GSI

Research Live for Undergraduates: Experience research in a major accelerator laboratory

During the summer months of 2017 HGS-HIRe and GSI organise a Summer Student Program which is offered to a limited number of students in physics or related natural science disciplines from Europe or GSI/FAIR partner countries.

General Information

Scope: Each participant joins one of the GSI research groups and works on a small project during the program. In addition a dedicated lecture series is held introducing the various research fields and applications at GSI. The program is complemented by introductory soft skills courses. Level: Advanced undergraduate level (3rd to 5th year of study, i.e. last year of Bachelor or during Master studies; PhD students are not eligible)

Duration: July 24 - September 14, 2017 (8 weeks)

Number of Participants: about 30 students

Accommodation and Reimbursement: Accommodation will be provided in a hotel close to GSI. A support towards travel expenses as well as a daily allowance will be covered

Qualification: Applicants should have completed the 3rd year of study as well as courses in one of the following three fields: nuclear physics, high energy physics, or atomic physics by the beginning of the program.

Applications: The application period for the 2017 program opens November 1, 2016 and will close February 15, 2017.

The application form can be found [here](#).

HGS-HIRe Summer Student Program at GSI 2017



Selected Events

[Conference on "Precision Physics, Quantum Electrodynamics and Fundamental Interactions"](#)
30th April - 5th May 2017, Paris, France

[IPAC'17](#)
14th - 19th May 2017, Copenhagen, Denmark

[International Conference on Precision Physics and Fundamental Physical Constants \(FFK\)](#)
15th - 19th May 2017, Warsaw, Poland

[Future Circular Collider Week 2017](#)
29th May - 2nd July 2017, Berlin, Germany

IBIC'17
20th - 24th August 2017, Grand Rapids, MI, USA

The background of the central graphic is black with intricate, glowing purple and blue patterns that resemble particle tracks or abstract light trails. A large, glowing purple sphere is suspended by a thin gold chain. Inside the sphere, a bright yellow light source is visible, with several white lines radiating from it, forming a stylized 'W' shape. The overall aesthetic is futuristic and scientific.

Season's Greetings and best wishes for the New Year.

Carsten, Thomas and Jochen

**Please email us your stories, news articles, events and position vacancies
to share them with the antimatter community!**

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FLAIR
Facility for Low-energy Antiproton and Ion Research

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