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Many signs for a promising 2016,

2016 promises to be an exciting year for the low energy antimatter physics community: It is a year in which our [LEAP](#) conference will take place – an ideal opportunity to get a comprehensive overview of recent results from measurements at the AD and plans for future experiments at CERN and at [F\(L\)AIR](#).

It is also the year in which the brand-new Extra Low ENergy Antiproton ring ([ELENA](#)) will be commissioned. This will add exciting additional experimental opportunities and will allow providing beams of higher quality than ever before.

With our very best wishes

Carsten, Thomas and Jochen



News from FAIR

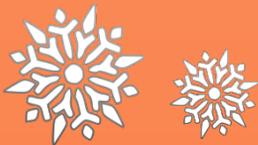
FAIR Council accepts new planning for the FAIR facility – end of construction in 2022

In an extraordinary meeting of the FAIR Council in September 2015 the shareholders of FAIR GmbH dealt with the status and future strategy for the realisation of FAIR.

The Council confirmed its goal to realise FAIR with the scope defined in the Convention (Modularised Start Version, MSV). A cost cap of 1,262 million € (price level 2005) was determined, plus site-related costs of 95 million €, resulting in an overall cost frame of 1,357 million €. In 2019, the project will be subject to an external review.

The shareholders have committed themselves to providing the financial means required for the project. In a first step additional funding of 158 million € as compared to the original planning will be provided which should give the project an extra push. The scientific significance of FAIR was highlighted once more by the Council and it confirmed its full support for the unique project.





A look back on the physics with antihydrogen

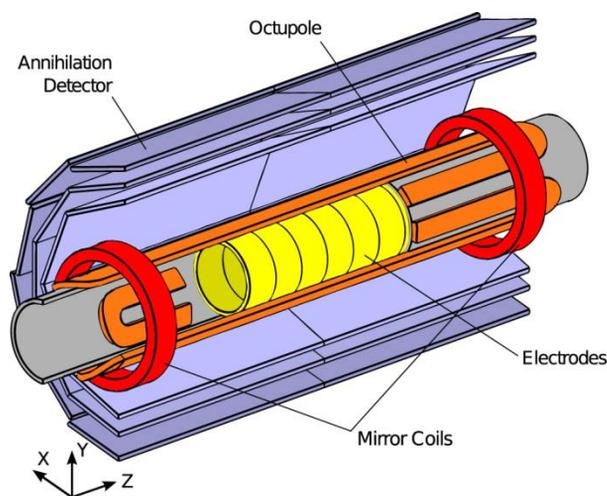
Over 40 years ago, researchers had already identified the numerous advantages of making measurements on antihydrogen atoms. These exotic particles offer precise, direct, and model-free opportunities to test the underlying assumptions of our present theories, and help lead the way to resolving the problem of excess matter.

At the time, and lacking a ready-source of this exotic atom, physicists began a long line of investigation into the production and preparation of low energy antimatter in general and ultimately antihydrogen. The first production of the latter took place in a high energy fixed target experiment at CERN in 1996, with the inflight production and detection of 9 relativistic antihydrogen atoms.

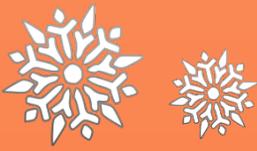
In order to actually study this and other antimatter systems, CERN built and commissioned the Antiproton Decelerator (AD) in 1999 to produce copious amounts of antiprotons for use in low energy experiments such as those involving antihydrogen. Shortly thereafter, the production of low energy antihydrogen was reported in 2002 by the ATHENA collaboration.

It proved surprisingly difficult to transform this antihydrogen source into a usable platform for measurements, but in 2010, ALPHA reported on the first trapping of antihydrogen for spectroscopic studies. A year later, they also performed the first measurement on it by directly driving an atomic hyperfine transition in 2011, a technique that is an important milestone in performing any precise measurements with this antiatom.

Today, at the AD hall at CERN, the activity in this field is growing, with a number of experiments racing towards the first precise comparisons of matter and antimatter and with more on the way given the anticipated arrival of ELENA, a major upgrade to the AD complex. It's an exciting time for our field, as any minute difference found between the behaviour of matter and antimatter would have profound and far-reaching impact to all areas of physics. The recently published article "Physics with antihydrogen" offers a comprehensive review of the current state of this research as well as the future directions of the collaborations involved in this activity.



Schematic of the central part of the ALPHA Apparatus showing the electrodes (yellow) the neutral trap magnets (red and orange) and the annihilation detector (blue).



International Workshop on Antiproton Physics and Technology at FAIR (FAIR-15) *November 16th - 19th 2015, Budker Institute of Nuclear Physics, Novosibirsk, Russia*



The Budker Institute of Nuclear Physics (BINP) in Novosibirsk hosted an international workshop on antiproton physics and modern technology in accelerator and detector physics for the FAIR facility from 16th to 19th of November, 2015. The event has gathered around 60 physicist and students from around the globe including Russia, Germany, Japan, Italy and Switzerland to discuss the current status of the FAIR project, issues, challenges and work plans for the coming years, as well as to exchange experiences in the relevant fields.

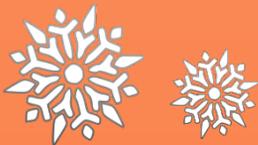
The workshop talks covered topics such as the PANDA detector and its physics program with high-energy antiprotons, as well as presentations about antiproton and ion beam production, acceleration and cooling. Dr Wolfgang Quint from GSI contributed a talk about the FLAIR physics program and current status of work at HITRAP and CRYRING@ESR.

The workshop was well-attended, in particular by many young physicists who got the chance to learn from their more experienced colleagues and pave the way for the future researcher careers.

All talk can be found via the workshop home: <http://fair15.inp.nsk.su> and additional photos can be accessed via this link:

<http://indico.inp.nsk.su/event/2/page/2>.

BINP is one of the key participants of the FAIR project. It is responsible for the full development of the Collector Ring (CR): This includes the project coordination and operation of the ring in different modes of operation. The primary purpose of the CR is to capture and cool secondary particle beams and further distribution them to other accelerators and experiments. Moreover, BINP participates in the manufacture of beam transport channels, as well as of important parts of the PANDA detector, including the forward RICH and dipole, as well as the target spectrometer solenoid.



More News and Events...

IBIC 2015 gathered the world's beam diagnostic experts



Between 13th -17th September 2015 beam diagnostics experts from around the world gathered in Melbourne, Australia for the International Beam Instrumentation Conference **IBIC**. IBIC is an established annual conference series. It is dedicated to exploring the physics and engineering challenges of beam diagnostic and measurement techniques for charged particle accelerators and light sources worldwide.

The conference included contributions about high dynamic range, high sensitivity beam profile monitors for various ion types, information about the latest results from measurements at the AD on a cryogenic current comparator for absolute beam intensity measurements, as well as contributions about laser-based monitors for non-invasive characterization of beams.

Joint Universities Accelerator School

The next edition of JUAS will be held at the European Scientific Institute in Archamps (France) from January to March 2016 and is open to 2nd year Master, PhD students and professionals.

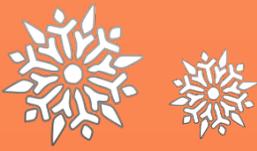
Founded in 1994, JUAS delivers an academically accredited training programme in accelerator science collaboration with CERN and a cluster of 15 European universities.

The 2016 programme was finalised following the meeting of the JUAS International Advisory Board, hosted by the University of Liverpool at the end of April. The school comprises two five-week sessions: 1) Sciences and physics, and 2) Technologies and applications of particle

accelerators. Classes are taught by leading specialists in their fields, and each session is concluded by an examination which enables students to earn ECTS credits recognised by their home university. The school is organised by European Scientific Institute with the support of 15 major European Universities and CERN.

PRE-REGISTRATION FOR JUAS 2016 IS NOW OPEN. For information please go to:

<http://www.esi-archamps.eu/Thematic-Schools/JUAS>



Shortage of accelerator and beam diagnostics experts risks limiting opportunities from new antimatter research facilities

NewStatesman

The weekly political and cultural magazine New Statesman has just published an article by Prof. Carsten P. Welsch highlighting the risks that a shortage of trained accelerator scientists poses on the advancement of key technologies.

The New Statesman article also points out the contrast between the investments being made by Europe in new accelerator facilities on the one hand and the lack of training programmes specialised in accelerator science on the other. This includes a complete lack of structured training programs at the interface between antimatter physics, facility design

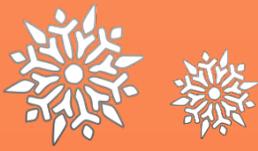
and beam diagnostics as would be required for a full exploitation of the potential of the ELENA and future FLAIR facilities.

The response from the wider community has been immediate: "I applaud you for the New Statesman piece identifying the challenges of insufficient accelerator scientists. I see the same problems, and would be glad to be part of any solution" says a Professor from the Scottish Universities Environmental Research Centre.

The full article can be downloaded [here](#)

Selected Research Papers

- C. Smorra, et al., "[A reservoir trap for antiprotons](#)", J Mass Spectrometry 389 (2015) 10–13
- U. D. Jentschura, "[Gravitational correction to vacuum polarization](#)", Phys. Rev. A 91, 022112 (2015)
- M. Fernandes, J. Tan, et al., "[A cryogenic current comparator for the low energy antiproton facilities at CERN](#)", Proc. IBIC, Melbourne, Australia (2015)
- S. Aghion, et al., "[Positron bunching and electrostatic transport system for the production and emission of dense positronium clouds into vacuum](#)", Nuclear Instr. and M. in Physics Research Section B 362 (2015)
- R. Lundmark, et al., "[Towards a precise measurement of the antihydrogen ground state hyperfine splitting in a beam: the case of in-flight radiative decays](#)", Journal of Physics B, Volume 48, Number 18 (2015)
- M. Diermaier, et al., "[An atomic hydrogen beam to test ASACUSA's apparatus for antihydrogen spectroscopy](#)", Hyperfine Interactions 1-6 (2015)



Position Vacancies

[Marie Curie Early Stage Career Fellowship – OMA project](#)

Several locations around Europe

[2016/17 Junior Research Fellowships](#)

Durham University, UK

[Post-Doctoral Fellow for the Inelastic Scattering Beamline ID20](#)

European Synchrotron Radiation Facility, France

[Postgraduate Opportunities](#)

Royal Holloway, UK

[RF Electronics Engineer - 81728](#)

Lawrence Berkeley National Laboratory, US

[Faculty Position in Accelerator Physics](#)

Michigan State University, US

[PhD Project Opportunities within the QUASAR Group](#)

University of Liverpool / Cockcroft Institute, UK

Please keep us informed about vacancies at your institution.

Selected Events

[12th International Conference on Low Energy Antiproton Physics \(LEAP2016\)](#)

6th - 11th March 2016, Kanazawa, Japan

[7th International Particle Accelerator Conference \(IPAC16\)](#)

8th - 13th May 2016, Busan, Korea

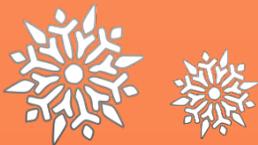
[International Beam Instrumentation Conference \(IBIC 16\)](#)

11th – 15th September 2016, Barcelona, Spain

[30th International Conference on Photonic Electronic and Atomic Collisions \(ICPEAC 2017\)](#)

26th July – 1st August 2017, Cairns, Queensland, Australia

The collaboration is often requested to present research highlights and suggest good speakers to various program committees. If you think you or your work should be highlighted, please do not hesitate to get in touch with us.



Merry Christmas
and a Happy New
Year to all friends
of anti-matter
research.



Carsten, Thomas and Jochen

www.flairatfair.eu

Spokesperson
Prof. Dr. Carsten P. Welsch
University of Liverpool/Cockcroft Institute, UK
carsten.welsch@cockcroft.ac.uk

FLAIR
Facility for Low-energy Antiproton and Ion Research

Co-Spokesperson
Prof. Dr. Thomas Stöhlker, GSI, Darmstadt, Germany
t.stoehlker@gsi.de
Prof. Dr. Jochen Walz, JG University Mainz, Germany
jochen.walz@uni-mainz.de