NEWS*letter*

Issue 16 April 2020

Highlights

Dear friends of low energy antimatter and ion physics,

These are exceptional times for all of us and I hope that you are all safe and healthy. COVID19 has had enormous impact on daily lives in countries around the world and this will likely continue to be the case for some time. CERN, as well as many research centers around the world, are shut down and it is currently unclear when any experimental studies can resume. For the AVA project, the current crisis has meant that we were unfortunately unable to hold our Advanced School on Precision Studies in Prague and instead had to resort to an online meeting. You will find a summary of this meeting in this MIRROR and you can access all talks via the event homepage.

Unfortunately we also had to postpone our final conference to 2021 because of COVID19 and existing travel restrictions. A new date will be communicated as soon as possible. We will do our very best to give our AVA Fellows and the network as a whole a good platform to present their research results to the wider community.

I believe we have managed to put together an interesting mix of research, Fellows' and partner news in this MIRROR and would like to thank all of you who contributed. I hope that you will enjoy reading the newsletter whilst working from home. Please contribute with your own news to our next issue which will be circulated in June.

Stay healthy!

Prof. Carsten P. Welsch,
Coordinator

Research News

Detector characterization during secondment at the Friedrich-Schiller University in Jena

Prototype of the Cryogenic Current Monitor

AVA Fellow David Haider (GSI) tested the new prototype of the Cryogenic Current Monitor during his secondment in the cryogenic laboratory of the Friedrich-Schiller University. The university offers an excellent environment to determine the performance of the new upgrade of the beam current monitor. Inside a magnetically shielded room where most magnetic perturbations are negated, the precision of the detector can be probed down to a few nano-amperes of simulated beam current. Moreover, selected noise sources can be imposed to determine the resilience of the system. At the laboratories at GSI there is no comparable shielded area available and thus it is very difficult to compare the performance of different detector models due to the changing magnetic background. With the support of the Friedrich-Schiller University and the experts at the Institute of Solid State Physics a reliable diagnostics of all detector upgrades can be realized.

The latest iteration of the Cryogenic Current Comparator was equipped with a modified superconducting shielding structure to increase the magnetic pick-up sensitivity and to minimize the effect of mechanical vibrations on the signal. *"The goal is to converge on a detector design with the superb current resolution of existing models, but with a much more robust signal and with an easier time to manufacture,"* says David. Further tests are scheduled in spring to explore the full potential of this new model.

ALPHA collaboration reports first measurements of certain quantum effects in antimatter

The ALPHA collaboration at CERN, which is closely related to the AVA network and involves for example AVA Supervisor Dr William Bertsche, has reported the first measurements of certain quantum effects in the energy structure of antihydrogen.

These quantum effects are known to exist in matter, and studying them could reveal as yet unobserved differences between the behaviour of matter and antimatter.

The results, described in a paper published in the journal Nature, show that these first measurements are consistent with theoretical predictions of the effects in "normal" hydrogen, and pave the way to more precise measurements of these and other fundamental quantities.

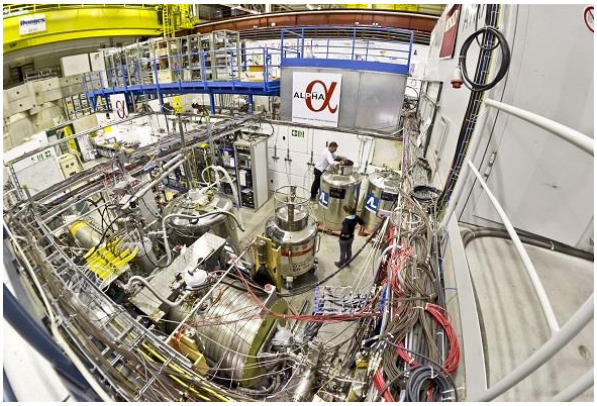


Image copyright CERN.

Finding any difference between these two forms of matter would shake the foundations of the Standard Model of particle physics, and these new measurements probe aspects of antimatter interaction, such as the Lamb shift.

The next big step will be to chill large samples of antihydrogen using state-of-the-art laser cooling techniques that rely on the work presented in the new paper. These techniques have the potential to transform antimatter studies and will allow unprecedentedly high-precision comparisons between matter and antimatter.

In ALPHA, antihydrogen atoms are created by binding antiprotons delivered by CERN's Antiproton Decelerator with positrons. They are then confined in a magnetic trap in an ultra-high vacuum, which prevents them from coming into contact with matter and annihilating. Laser light is then shone onto the trapped atoms to measure their spectral response. This technique helps measure known quantum effects such as the so-called fine structure and the Lamb shift, which correspond to tiny splittings in certain energy levels of the atom, and were measured in this study in the antihydrogen atom for the first time.

The fine structure was measured in atomic hydrogen more than a century ago, and laid the foundation for the introduction of a fundamental constant of nature that describes the strength of the electromagnetic interaction between elementary charged particles. The Lamb shift was discovered in the same system about 70 years ago and was a key element in the development of quantum electrodynamics, the theory of how matter and light interact. The Lamb-shift measurement, which won Willis Lamb the Nobel prize in physics in 1955, was reported in 1947 at the famous Shelter Island conference – the first important opportunity for leaders of the American physics community to gather after the war.

The paper `Investigation of the fine structure of antihydrogen' was published in *Nature*.

Network News

AVA welcomes new Partners

The AVA consortium is pleased to announce its new partner organisations - ETH Zurich, INFN Genova, University of Bath and Friedrich Schiller University of Jena. Due to the developments in the research projects of some AVA Fellows, it was advantageous to expand the network and complement the expertise within AVA.

Institute for Particle Physics and Astrophysics (IPA) from the Physics Department of the Eidgenössische Technische Hochschule Zürich (ETH Zurich) has joined AVA for the purpose of hosting a secondment of the AVA Fellow Amit Nanda. As a member of the GBAR project (Gravitational Behaviour of Anti hydrogen at Rest) at CERN, IPA is already deeply involved in antimatter research. Similar to the majority of the antimatter projects encompassed by AVA, GBAR is located at the Antiproton Decelerator of CERN. The primary focus rests upon precise gravity studies of antimatter. However, IPA also aims for a measurement of the Lamb shift in antihydrogen. They currently operate a hydrogen beam experiment at ETH to prepare the equivalent study on antimatter when accelerator operation is restarted at CERN after the current long shut down. This project uses very similar techniques as the measurement on the hyperfine structure of (anti-) hydrogen, which are pursued by the ASACUSA collaboration that Amit is part of.

Prof Gemma Testera of INFN Genova is recognized as being one of the world experts on ultra-cold charged plasmas. For decades, she has been leading a group that has specialized in the physics of cold charged plasmas and has a very long-standing involvement in antiproton-related research (inter alia in the ATHENA and AEgIS experiments at CERN's Antiproton Decelerator), in precision measurement electronics at cryogenic temperatures, in ultra-fast and low noise control electronics and in plasma diagnostic techniques. AVA Fellow Mattia Fani has expanded the scope of his research project by further focusing on the behaviour, manipulation and characterization of ultra-cold antiproton plasmas, as well as on detection techniques for cold positrons and positronium. In the course of the analysis of his data, it has become clear that he could deepen his expertise in the field of cold charged plasmas by interacting with one of a handful of experts in Europe in this field – Gemma Testera. This provides Mattia with a unique opportunity to acquire expertise on the physics of ultra-cold antiproton and positron plasmas, undoubtedly of benefit also to several other AVA partners.

Much synergy in the research of AVA Fellow Bruno Galante and Dr Cole at the University of Bath (UoB) has been identified. This CERN-Bath collaboration will provide direct access between nanoscale material engineers and particle accelerator end-users, providing a very valuable means of engineering dedicated nanostructured electron sources that are tailored to the functional and research needs of CERN researchers.

The collaboration also presents a unique opportunity to identify applications at higher technology readiness levels. Equipment sharing is a critical part of this collaboration, with Bruno being granted in-kind access to the UoBs Vacuum Nano Electronics laboratory's field electron emission measurement system. This custom-built, state-of-the-art electron emission measurement system is the only one of its kind in the UK and has measurement capacity that aligns extremely well with the needs of Bruno's AVA project. It gives Bruno the opportunity to research the growth and electron emission properties from 1D carbon nanomaterials and their application in advanced electron emissions sources.

Finally, the Friedrich Schiller University of Jena (FSU Jena) in Germany offered to AVA Fellow David Haider to carry out a secondment at the Institute of Solid State Physics under the supervision of Prof. Frank Schmidl. The group of Prof Schmidl focuses on the development of SQUID-based magnetic field measurement for use in unshielded environments. This will benefit the development of non-contact magnetic field sensors for heavy-ion and antimatter research. The knowledge of the group is very relevant to David's research and allow him to participate in measurements to characterize both, finished CCC-sensors and CCC-sensors under construction.

A very warm welcome to all new AVA Partners!

New Project Manager joins AVA

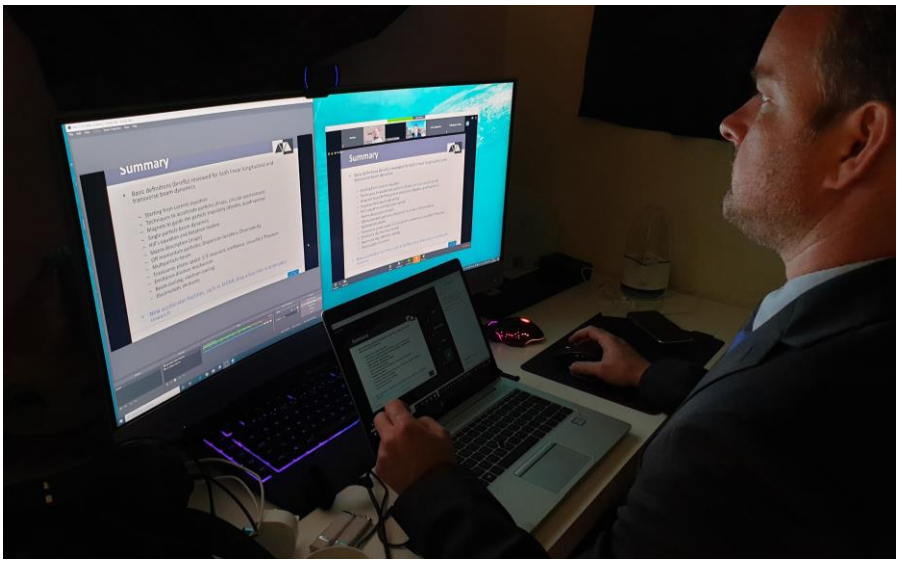
The AVA consortium would like to welcome Dr Theun van Veen, who joined AVA as Project Manager in April 2020.

Theun obtained a degree in Biomedical Engineering at the University of Twente (The Netherlands) and as part of his MSc he did an internship at the UK Centre for Tissue Engineering (University of Liverpool). He then moved to the UK in 2010 to study for a PhD in Clinical Engineering at the University of Liverpool as part of a 7th Framework Funded Project (EU) on which he continued to work as a postdoctoral researcher.

In 2015, he was appointed as the Scientific and Quality Control Manager for the LBIH Biobank at the University of Liverpool. In this role he was responsible for the RD&I aspects and quality control procedures relating to human biosamples as well as co-ordinating collaborative projects both within the university and with external partners.

Welcome!

AVA School on Precision Studies



Due to the COVID19 outbreak the AVA school took place online.

The AVA network held an advanced school on precision studies between 23-27 March 2020. This event was originally planned to be held in Prague in the Czech Republic, however, the current travel restrictions made this no longer possible. To keep a significant part of the School content, it was decided to hold the meeting as an online event, using Zoom as video conferencing tool.

In total, more than 50 participants joined the event which saw lectures and topical talks given by world-leading experts. They presented the latest results in theoretical and experimental antimatter studies along with wider research in accelerator science and particle physics.

The event started with a recap of the basics of beam handling and cooling techniques, instrumentation and particle trapping on the first day. This was complemented with an in-depth overview of the experimental programme at the Antiproton Decelerator (AD) facility at CERN where currently all of the low energy antimatter physics research is carried out. Presentations highlighted the state-of-the-art and the challenges associated with limited intensities, machine access and required precision.

The School continued by putting the AVA research programme into a wider context. This included 'classic' particle physics experiments, interferometry and quantum technologies. These talks helped understand the wider context in which precision studies are placed. More than 20 poster contributions, all available via the event indico page, were also contributed to the School.

The slides from all talks are already available via the event website; recordings from the talks will be made available in the near future. The invaluable help of FOTON and the Institute of Physics of the Czech Academy of Sciences is acknowledged!

More information about AVA can be found on the project homepage.

Upcoming Event

Virtual Seminar on Precision Physics and Fundamental Symmetries, starting March 2020

This virtual seminar series is an initiative of the precision physics and quantum information community and will be organized during the COVID-19 shutdown.

The seminars will address specific topics of the fields of precision measurements, tests of fundamental symmetries and quantum information.

Starting from 2020/03/31, two seminars per week will be offered, which will take place Tuesday and Thursday, for each seminar 90 minutes are allocated. The time slots of the seminars are defined by the speakers and therefore flexible, participants, please check the program below.

Slides will be provided on INDICO, it is planned to stream the event via "zoom".

For continuous updates please check the seminar website
https://indico.cern.ch/category/12183/

Fellows Activity

AVA Fellows visited local schools to fascinate pupils about antimatter physics

Looking back at 2019, it was a busy year for AVA fellows not only in terms of research, but also in communicating science. Outreach is an important part of every project funded by Horizon 2020 and therefore AVA supports its Fellows to promote the network and antimatter physics to variety of audiences. Apart from organising network wide outreach activities such as Outreach Symposia and Public talks, all AVA Fellows also contribute to outreach by their own individual events including for example visiting local Schools.

First school visit of 2019 was by Dominika Alfs who visited her former high school in January 2019 and had about an hour-long conversation with the students from the 2nd grade of high school (out of 3 grades, 18 years old) and other students interested in Physics. The talk was part of a series of meetings with former students. At the beginning, Dominika described her experience - from high school, studies in Physics in Poland and finally her PhD in Germany. She tried to explain her current project by starting from the concepts that students already know (elementary particles, principles of interaction of charged particles with matter etc.) and connecting them with the detection methods. This was then linked to the high energy physics, CERN and finally - low energies and antimatter research as she is studying it herself within AVA. A second part was focused on the opportunities for students both in Poland and abroad. *"There are several scholarships or internship possibilities, but high school students are rarely aware of them or they learn about them too late to plan accordingly"*, explained Dominika why she covered such topic in her presentation. The last part was an informal discussion with students and answering their questions. In October 2019 one of the older students participating in the event started his bachelor's in physics at the same university where Dominika studied and they have maintained the contact ever since.

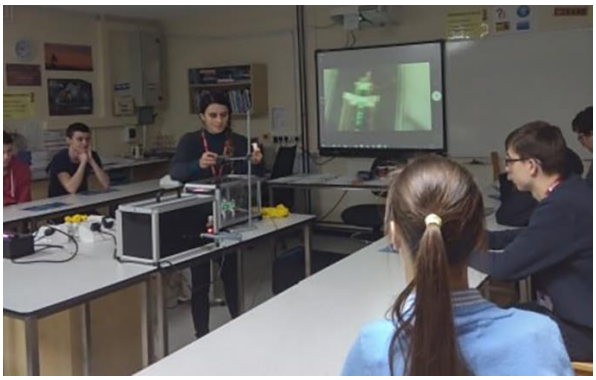
Other Fellows left their school visit for the end of the year when the term curriculum is coming to an end before Christmas break. Ilia Blinov visited St. Katharin Gymnasium in Oppenheim, Germany. The Gymnasium has a mathematical and scientific focus and gives great importance to the STEM subject's - mathematics, computer science and natural sciences (biology, chemistry and physics) as well as computer-assisted learning and the use of modern media. Ilia gave a talk to the students and spoke about his work at Stahl-Electronics and the peculiarities of working as an electronics engineer. His presentation also included information about the AVA project and antimatter research in general. He discussed the problems and experiments in the field of antimatter with the students and answered the questions they prepared before his arrival, this included questions about antimatter production and how antimatter is used in industry.

Ilia presenting at St. Katharin Gymnasium.

Miha Cerv visited two high schools in his home country Slovenia - Škofijska gimnazija Vipava (his former high school) and Šolski center Nova Gorica. He presented his research in the AVA project and he also described his studies at the University and the path that led him to his current Fellowship position in AVA. Part of his talk was dedicated to EU-funding and the background of the AVA network, highlighting how students could take part in similar projects in the future themselves. He also talked about his day-to-day work and experience with measurements at CERN in an attempt to demystify the life and work of scientists. For students interested in physics he also covered more technical details about his work and have an insight into the scientific methjods that he learned during his AVA Fellowship. Last, but not least, he talked about living abroad and how this is not something to be afraid of, but a very rewarding experience.

Miha's talk at ŠGV high school, Vipava, Slovenia.

David Haider visited Grimmelshausen High School in Gelnhausen, Germany, where he gave a lecture to two high school classes in their final two years before graduation (16 to 18 years old). His lecture covered his own career in research wrapped with stories from his AVA research project and the physics at GSI. It was attended by students selected to be part of an intensive training course in physics. They got the unique opportunity to get an insight into what opportunities a research career can offer. *"For the majority of students at high school an academic career, unfortunately, is only a very vague and distant concept. I tried to bring the topic closer to the audience by exploring topics such as: Why do people choose to become researcher, what makes their everyday work interesting, how can one participate in this quest for knowledge?"*, described David.



Siara demonstrating to the class.

Siara Fabbri gave one hour talk and demonstration on antimatter physics to 15 A level physics students at Furness College and Barrow Sixth Form located in Barrow-in-Furness, Cumbria. *"I particularly wanted to visit students at this college given that Barrow-in-Furness is considered to be a highly deprived area in England according to National Statistics, English indices of deprivation 2019",* Siara explained her location choice.

Her talk covered what antimatter is, how it has been portrayed in media, its history and discovery, the fundamental problems facing scientists today regarding antimatter, the research going on at CERN on antimatter, and what she personally gets to do as a PhD student studying antimatter as part of AVA network. After the talk, she had the students come up in groups to interact with two demonstrations – a particle trap and a hydrogen discharge tube with diffraction gratings for the students to look through.

AVA Fellows Dominika Alfs and Amit Nanda participated in the European Researchers night

The MSCA European Researchers' Night is a yearly event organized at institutions all across Europe and supported by Marie Skłodowska-Curie Actions. On the day, most institutions cover a variety of disciplines and are open until late at night and offer a range of engaging outreach activities, such as lab tours, lectures, workshops, science-related competitions and hands-on activities. In 2019 the event took place on 27 September in many countries across Europe. Two AVA Fellows, Dominka Alfs and Amit Nanda participated by supporting their local institutions.

The 2019 edition gathered about 73,000 participants in Poland. Dominika Alfs participated in the Researchers' Night at the Jagiellonian University in Krakow. She prepared and led one of the workshops for 5 - 10 years old children. The name of the workshop was 'How to Defeat a Dragon" and it was a combination of demonstrations and hands-on activities from Physics and Chemistry. All hands-on activities were performed with products that are either used every day in household or are easily available. Besides the fact that science is fun, the main messages of the workshop were that even things which look like magic can be explained by science and that one does not need complicated tools to learn about some phenomena. Older kids and parents were often interested in detailed explanations of experiments.

Hands-on activities during the Researchers' Night in Krakow.

Sci4all (Science for all of us) was Austria's contribution to the Europeans Researchers' Night and in 2019 it was held on at the University of Applied Arts. This was organized by the Practical Robotics Institute Austria in cooperation with the University of Natural Resources and Life Sciences (BOKU), FH Campus Vienna, Science Communications, Kinderbüroder Universität Vienna and Universität für angewandte Kunst Vienna.

The Stefan Meyer Institute, which is also the host institute of AVA Fellow Amit Nanda, was represented with two projects in this event: the ALICE and the ASACUSA experiments at CERN. Amit had a very active participation in the demonstration of the ASACUSA experiment. He took part in the building of a linear Paul trap for this outreach activity. During the demonstration, the public, the children and young people were encouraged to understand the science behind such a trap. They enjoyed watching the live motion of charged particles. They could even play with a safe DC power supply source to decide where to move and hold the charged particles. To further explain better how the electric field changes in time and helps to confine the charged particles, Amit played an animation of the electric field simulated for this trap.

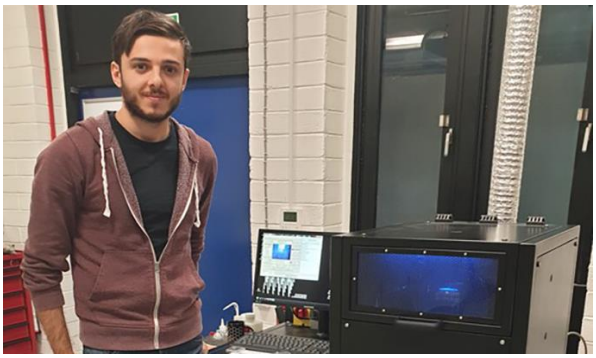
Apart from the demonstration of the trap, Amit guided the visitors through an ASACUSA poster which shows the main motivation for fundamental research on antimatter, what properties of antimatter does ASACUSA want to measure, how they create antimatter and the complexity of the apparatus used in such experiments.

Amit explaining the hyperfine structure of (anti-)hydrogen and the importance of its precise determination.

During the discussion of the poster, Amit became friends with some students doing their masters and bachelors in different universities in Vienna. The impact was obvious because after the event some of them contacted him directly to learn more about antimatter, which he was personally very happy to tell.

The University of Bath hosted Bruno Galante on a secondment

In November 2019 AVA Fellow Bruno Galante visited the University of Bath for a secondment in the Nanotechnology Laboratory. In this environment, Bruno could gain expertise in all the steps necessary for the growth of carbon nanotubes (CNTs).
CNTs are at the base of the studies conducted by Bruno regarding the generation of cold electrons for the optimization of electron cooling in ELENA, in particular the optimization of the electron gun generating the electron beam necessary for the cooling process. In the Nanotechnology Laboratory in Bath, it was possible for Bruno to first learn and familiarize himself with all the techniques involved in CNTs growth and then reproduce all of them independently.



Bruno during his secondment at the University of Bath.

There were several skills that Bruno acquired: design of custom patterns for the CNT array, vaporization of catalyst material on Silicon (Si) wafer, Si wafer cutting and ultimately the Chemical Vapor Deposition (CVD) growth itself, which finally allowed CNTs growth on the top of pre-treated wafers.

All the samples produced will be part of a set of experiments to be conducted jointly by CERN and Bath. Furthermore, a second secondment is being planned in order to conduct some Field Emission (FE) experiments in Bath with their FE rig. This further step would allow to compare results achieved with similar, yet different, experimental setups and gain expertise with different instruments and technologies.

CERN hosted ten days of secondment for AVA Fellow Indrajeet Prasad

CERN - The European Organization for Nuclear Research hosted ten days secondment of AVA Fellow Indrajeet Prasad in December 2019 in Geneva, Switzerland. The secondment was a part of his AVA research project aiming to build & test High Precision Power supply.

The secondment aimed at gathering information about high voltage power supplies used at various experiments at CERN. Indrajeet had a very productive time at CERN, he visited multiple experiments based at the Antimatter Factory and was given a technical tour of the Antihydrogen Experiment: Gravity, Interferometry, Spectroscopy (AEgis) by the experiment spokesperson and senior scientist Dr Micheal Doser. Dr Doser also informed Indrajeet about customized high precision High voltage Power supply used at Aegis experiment at CERN.

Dr Gerard Tranquille showed Indrajeet The Extra Low Energy Antiproton ring (ELENA) where he learnt about the commercial & customized High Voltage power supply used for ELENA. AVA Fellow Bruno Galante guided Indrajeet through his lab explaining his experimental setup and results.

Indrajeet also visited some other experimental setups where he learnt about various PS used at CERN. He met with ELENA Project leader Christian Carli and learned about Management tools and frameworks being used for Project Management.

Indrajeet Prasad at CERN.

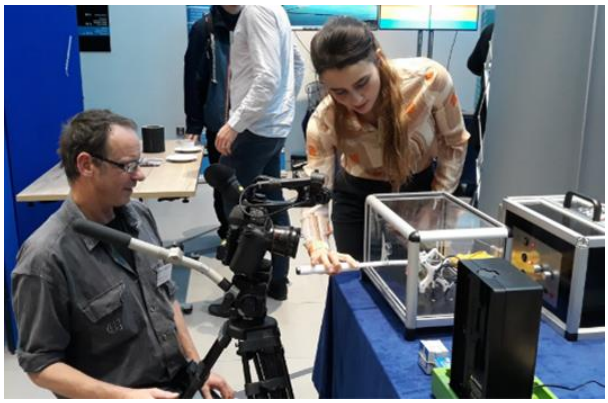
It was a very successful 10 days as Indrajeet achieved his secondment tasks as well as got a glimpse of Project management of ELENA at CERN.

CERN is the pioneer of Antimatter Research facilities and one of the AVA partners. All AVA Fellows benefit significantly from this important collaboration.

Siara Fabbri demonstrated particle trap at EPSRC Showcasing Physical Sciences Impact Event

Siara Fabbri, along with a Post Doctoral researcher and Professor from the ALPHA Experiment, showcased how the antimatter experiments are impacting the public in terms of economics, culture, knowledge, and people at EPSRC Impact Event 2019. The event took place on 6th of December 2019 at the Institute of Physics in London, UK. Their group demonstrated advanced outreach tools pertaining to antimatter physics, as well as posters on antimatter physics and outreach by the antimatter community. As the coordinator for her group's representation at this event, Siara was in charge of creating the posters and brochures regarding outreach and education on antimatter science, along with attending weekly meetings leading up to the event. She also has spent a lot of time contributing to upgrades to one of the two demonstrations, a particle trap, which she had already previously demonstrated earlier on in the year at the Accelerators for Science and Society Symposium co-organised by AVA.

The event was a huge success, and several pictures and videos of the antimatter group's particle trap were tweeted, such as this video of Siara demonstrating the particle trap.



Siara demonstrating the particle trap.

Early Career Conference on Trapped Ions 2020

Between 13 and 17 of January, CERN hosted the first edition of the Early Career Conference on Trapped Ions (ECCTI 2020), which focused on the different research fields of trapped ion applications. The conference aimed at giving PhD students and early career researchers the opportunity to present their work to a supportive international audience and included useful skill-developing sessions.

AVA Fellow Bianca Veglia was invited to be a member of the scientific committee. Bianca is working on her PhD research at the University of Liverpool studying the ELENA electron cooler, a new decelerating ring which is designed to improve the quality of the antiproton beam used by antimatter experiments. Thanks to electron cooling at lowest energies than ever before, the number of available antiprotons can be increased by a factor of 100, paving the way for new experiments.

Bianca's role in the scientific committee was to select and chair the talks related to antimatter research. The conference was a great success with 73 participants coming from different institutions across 16 different countries. It brought together researchers from different fields giving opportunities for networking and knowledge exchange.

Trapped ions have many applications in different research fields. One of these is Quantum Information and Computing, topics of global interest in the present days. Other talks during the conference covered atomic clock research, quantum optics, precision measurements and quantum simulations together with two antimatter sessions. Members of ALPHA, BASE and GBAR collaborations presented their latest results in antimatter experiments.

The conference ended with tours of the LHC detectors, ATLAS and CMS.

Partner News

Hunting Season for Matter–Antimatter Asymmetries

CPT'19 conference delegates (photo by Yunhua Ding).

The CPT Theorem ensures a perfect mirror symmetry in the established laws of nature: the physical properties of matter and antimatter are identical in magnitude. However, the quest for more fundamental physics frequently challenges the unchecked reign of CPT invariance, predicting asymmetries between particles and antiparticles detectable with present-day and near-future measurements.

Experimental tests of both CPT symmetry and the closely associated invariance under Lorentz transformations took once again center stage at the 8th Meeting on CPT and Lorentz Symmetry (CPT'19) held May 12–16, 2019. Around 120 leaders in the field from five continents converged at Indiana University Bloomington to discuss recent results and map out future efforts in the search for tiny asymmetries between matter and antimatter.

The Standard-Model Extension (SME), established by Alan Kostelecký and his colleagues at Indiana University more than two decades ago, forms the modern basis for the general theoretical description of departures from CPT and Lorentz invariance. The meeting featured recent SME advances, such as the classification of general CPT violation in gauge theories, Finsler geometry and CPT-breaking scalar fields, and phenomenological implications of nonminimal CPT breakdown in antihydrogen, trapped charged antimatter, and neutral-meson oscillations.

The latest key advances involving antiprotons and positrons from experiments including ALPHA, ASACUSA, BASE, J-PET, and QUPLAS represented a major component of the conference averaging roughly two presentations per day. Most of these efforts are on track to measure SME coefficients with unprecedented precision. A further central conference topic was dedicated to CPT tests with antimatter beyond the first family, such as searches at the quark–antiquark level (KLOE, LHC) as well as effects involving antimuons (Muon g-2) and antineutrinos (Daya Bay, DUNE, IceCube, KATRIN). As such tests are sensitive to different sets of SME coefficients, they provide an exciting complementary avenue to study matter–antimatter asymmetries.

The conference more than anything else highlighted the rapid and unabated progress in the exploration of antimatter in general and antihydrogen physics in particular. These experimental developments are supported by concurrent theoretical advances in the SME framework showcasing the timeliness of this research area. At this pace, the outlook for a physics breakthrough in the field is truly optimistic.

Sad news for the beam instrumentation community – Julien Bergoz

Julien Bergoz
(Image copyright Bergoz Instrumentation)

It is with great sadness that I have to inform you of the passing of Julien Bergoz, founder and manager of the company that holds his name for more than 37 years.

Julien has developed and commercialized a number of key technologies for particle accelerators and light sources and has built a successful business around these innovations.

He has also contributed to the training of generations of accelerator scientists and engineers. This included bespoke trainings as part of the Joint Universities Accelerator School (JUAS), sponsoring of the Faraday Cup award for outstanding development in beam instrumentation, as well as partnering with MSCA Innovative Training networks.

When we started discussions about our first pan European network DITANET back in 2007, Julien did not hesitate one second to join us in this initiative when I approached him.

He has since been a key partner in oPAC and most recently in our AVA project, where our Fellows were offered a hands-on training day at Bergoz in 2018.

Julien was always open for discussions about R&D ideas and it was a pleasure to meet him at conferences all around the world. In him, our community has lost an innovator, very reliable commercial partner, and friend.

Carsten P Welsch

Position Vacancies

AVA Research Fellow in Beam Diagnostics and Particle Detection
A 7-months AVA Fellowship is available at CIVIDEC Instrumentation Gmbh in cooperation with Vienna University of Technology, the Faculty of Electrical Engineering & Information Technology and the Faculty of Physics.

You will be investigating the application of a diamond membrane detector for Antimatter research. You will be analysing experimental data, which was taken during beam tests with a prototype detector in 2017-2018 at the AEGIS experiment at CERN. You will be studying the interaction mechanisms of antimatter with matter and will the design an ultra-thin, vacuum compatible diamond membrane detector and the related front-end electronics for antimatter research.

The position also gives excellent opportunities to gain hands-on experience in detector design, read-out electronics, digital data processing and data analysis. Depending on performance, there are opportunities to continue working for CIVIDEC after the end of the Fellowship. **More information can be found here**

Postdoctoral Fellow in free electron laser design
The SXL (Soft X-ray Laser) project is a project for a Free Electron Laser in the soft X-ray energy range at the MAX IV facility at Lund University. An initial design study is funded and will be completed in 2021. The funding comes from the Knut & Alice Wallenberg foundation and several Swedish universities. The SXL will be based on the 3 GeV linac already in operation at the MAX IV.

The Post doc position is placed at the Science faculty at Lund University. The FEL modeling of the SXL is led by Ass. Prof. Francesca Curbis and the group's work on Free Electron Laser studies is co-ordinated by Prof. Sverker Werin.

The main duties involved in a postdoctoral position is to conduct research. Teaching may also be included, but up to no more than 20% of working hours. The position shall include the opportunity for three weeks of training in higher education teaching and learning.

The initial task will be to work with the final building blocks of the FEL simulations for the SXL project, relevant for the initial design study.

In the second part, the baseline design provides a parameter space which should be expanded with advanced modes of operation. This includes sub femtosecond pulses, coherence enhancement, two colour and double pulses. Here creativity and exploring the special features in the baseline are important. This can also include going beyond the SXL project, and address similar questions in a more general approach relevant for FEL development as such.

The project may also include measurements on the existing accelerator at MAX IV, to verify the accelerator modeling, and beam time at operating FELs (especially FLASH and FERMI).

More information can be found here

Beam Diagnostics Physicist / Engineer
Advanced Oncotherapy is an innovative technology business focused on delivering a proton-based radiotherapy system using technology originally developed and tested at the world-renowned CERN facility in Switzerland.
Proton beam therapy is likely to play a crucial role in the affordable treatment of cancer in the future. Advanced Oncotherapy's system is based on a linear accelerator ('LIGHT') technology that is superior to traditional cyclotron/synchrotron accelerators and significantly less expensive to implement than its competitors. The company acquired the technology through the acquisition of A.D.A.M. SA, a CERN spin-off company, in 2013. The first LIGHT system is being installed and commissioned at our test site at STFC Daresbury, in the north of England, prior to shipping to our customer sites.
The post holder will be in charge of the installation and commissioning of the beam instrumentation foreseen in the LIGHT proton therapy accelerator at Daresbury STFC (UK). As a beam instrumentation expert, he/she will have to coordinate or participate in all the needed tests to operationalize the instruments in due time. The post holder will have an active role during the beam commissioning in the control room, by performing measurements, developing analysis tools and debugging the accelerator.
Once commissioning is over, he/she will be involved in the continuous operation and maintenance of the machine in the control room. The role will involve travel in Europe and work on shifts.

More information can be found here

PhD position for developing a transportable antiproton trap
A PhD position for developing a transportable antiproton trap is open at the Institute of Physics at the University of Mainz. The position is associated to the ERC project STEP, which aims to develop and use a transportable antiproton trap to improve the high-precision measurements of the BASE collaboration comparing the fundamental properties of protons and antiprotons in advanced Penning trap systems. Interested persons should contact Christian Smorra: christian.smorra@cern.ch

Further details on the application can be found on here

Postdoctoral position within the BASE collaboration
We are seeking for a Postdoctoral researcher to work on the development of sympathetic cooling methods for protons and antiprotons and a high-precision measurement of the g-factor of the proton within BASE (Baryon Antibaryon Symmetry Experiment) in Mainz, Germany. Interested persons should contact either Klaus Blaum: klaus.blaum@mpi-hd.mpg.de or Christian Smorra: christian.smorra@cern.ch

More details on the application can be found here

PhD position on machine-learning in Secondary Emission Monitor (SEM) optimization
Secondary Emission Monitors (SEMs) are used at accelerator facilities around the world to characterize charged particle beams. You will work on the optimization of monitor design, implementation, operation and in particular image analysis. Your work will include yield studies in simulation and experiments, aiming at improving the absolute calibration, as well as the calibration stability of SEM Foils used in the CERN Super Proton Synchrotron slow extraction lines. This project is funded for 4 years and part of the Center for Doctoral Training on Big Data Science LIV.DAT. You will spend years 1 and 4 at the Cockcroft Institute/University of Liverpool, years 2 and 3 at CERN. **More information can be found here**

Sending our best wishes to all our readers.

Stay safe!

Notice Board

This newsletter is published on a quarterly basis. Help us keep it interesting by providing your news and updates.

DEADLINE FOR THE NEXT NEWSLETTER CONTRIBUTIONS: 5th June 2020

www.ava-project.eu

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721559.