



Highlights

- Design studies microwave devices for hyperfine spectroscopy
- Research results presented at GSI Atomic Physics Workshop
- Importance of antimatter research showcased at international Symposium
- AVA Fellow inspires Indian students to study in Europe

Dear friends of low energy antimatter and ion physics,

All of our Fellows and their supervisors came to Liverpool this summer for an outreach symposium on accelerators for science and society on 28 June 2019. This was a large scale event at the Arena and Convention Centre and allowed our network to join forces with the [OMA network](#) on Medical Accelerators and the Liverpool Centre for Doctoral Training on Big Data Science [LIV.DAT](#). By teaming up, a very broad spectrum of research activities where particle accelerators are currently used was presented. We had a fascinating [talk](#) on why antimatter matters by AVA Steering Committee member Dr Michael Doser from CERN and our Fellows did a fantastic job in presenting their research through both, posters and hands-on activities. The event also allowed me to put the unique training within AVA into a much wider context by presenting how ITNs help [Accelerating Researcher Careers](#). The talks were live-streamed to institutions across Europe, making the Symposium a truly pan-European event and excellent success for our project. I was particularly happy that the family of Ava Scott, the girl after which our project is named, managed to join us for this event. By making the link with OMA and also having UK cancer charities join us, we helped raise awareness of childhood cancer.

A series of articles have just been published to help create better awareness of the importance of particle accelerators for science and society, this includes [What have particle accelerators ever done for us?](#) in Physics World, [the biggest surprises always came from serendipitous discoveries](#) in E + T Magazine and [Exploring Antimatter Physics and Future Applications](#) in AZO Quantum which connects directly to AVA.

Finally, I am happy to confirm that our last Fellow, Yeqiang Wei, has now started at CIVIDEC and look forward to meeting him at our next event.

I hope you will enjoy this MIRROR and keep sending us your articles so we can keep it interesting and relevant for our community.

A handwritten signature in black ink, appearing to read 'Carsten Welsch'.

Prof Carsten P Welsch
AVA Coordinator

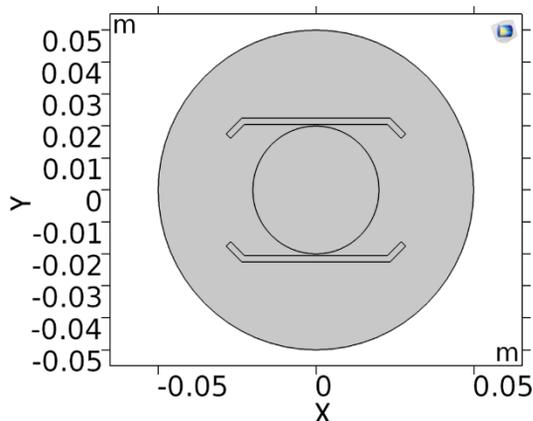
Research News

Design studies of microwave devices for hyperfine spectroscopy

The spring of 2019 kept our AVA Fellow [Amit Nanda](#) occupied with his secondment at CERN.

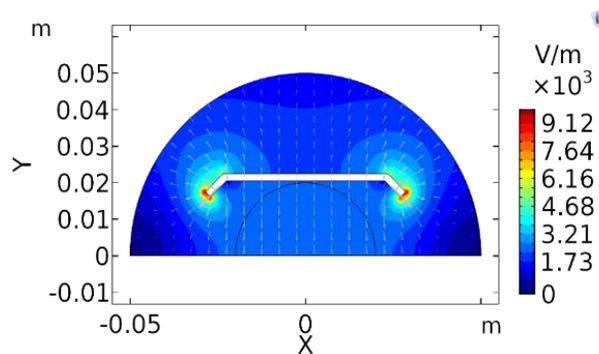
Together with Dr Fritz Caspers from CERN, he worked on the design of a broadband microwave device which can be integrated into a Ramsey type spectrometer for measuring the ground state hyperfine splitting of hydrogen.

An image of the cross section of the geometry of the stripline structure that Amit studied using COMSOL simulations is shown in the image below. The device consists of a 100 mm vacuum chamber housing a pair of electrodes. These would be further coupled to RF feedthroughs and excited with TEM waves. The device would be operated in differential mode, meaning the two stripline electrodes would be excited with a phase of π w.r.t each other.



During his secondment, Amit studied simulations of such structures by varying the parameters of the electrodes, namely, width (W), thickness (T),

distance between them (D) and the width of the wings (W_{wing}) adjacent to it. In the simulations he used the mirror symmetry of the problem and used only half the structure to study its electrostatic properties. The electric field pattern resulting from such a simulation $W = 5$ cm, $D = 4.1$ cm, $T = 0.2$ cm and $W_{wing} = 0.7$ cm is shown in the image below. By the end he was able to figure out the optimum geometry of a stripline structure which would have an impedance of 50Ω . The circular boundary between the striplines represents the area of interest where the hydrogen beam will be present. For the set of dimensions described earlier, the electric field inhomogeneity (standard deviation/ average of the electric field norm) in this region was less than 1%.



Through his secondment, Amit was very happy to benefit from the expertise of Dr. Caspers on RF structures. The simulations which he did during his stay at CERN would help him build the microwave device optimum for the hyperfine spectroscopy of hydrogen.

Research results presented at GSI Atomic Physics Workshop

The GSI atomic physics department held a workshop in May to report on the progress within the department over the last year. There were three days of sessions divided into 5 topical areas. Participants discussed advancements at CRYRING and the ESR as well as the progress of the FAIR facility and plans for the day 1 experiments at FAIR.

In a session focused on HITRAP and trapping experiments, AVA Fellow, [Jeffrey Klimes](#), presented an update on the progress in connecting the HITRAP low-energy beamline to the ARTEMIS experiment

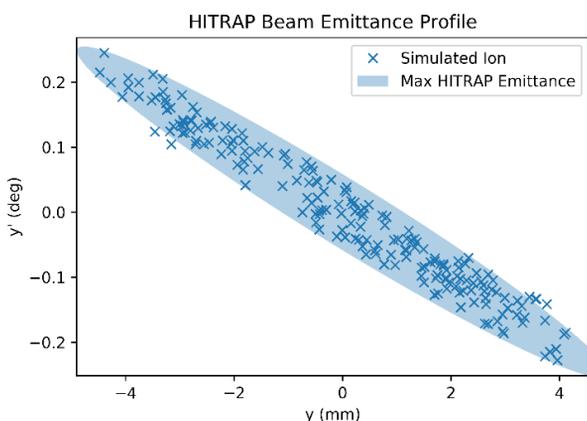


Figure 1: Matching the simulated beam to HITRAP

At the time, work was focused on the results of a simulation of a pulsed drift tube (PDT) that will be used as the last stage of deceleration before injection into the ion trap. The simulation, which was done in SIMION and benchmarked with COMSOL, demonstrated a good agreement to measured ion beams at HITRAP and concluded that the PDT could be implemented in the room-temperature, low-magnetic-field region below the cold valve that will isolate the trap from the rest of the beamline. Figure 1 shows the simulated and actual beam emittance before the PDT, and figure 2 shows the transmission vs voltage in the high-voltage state of the PDT.

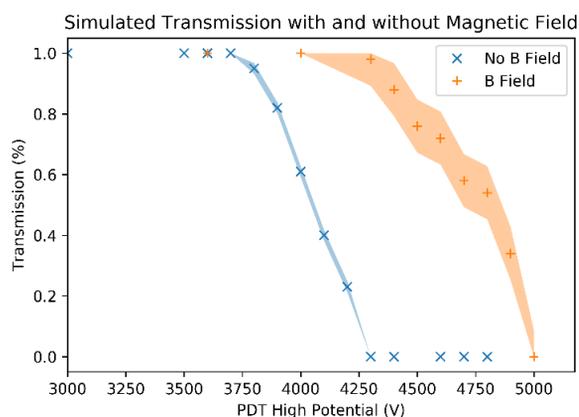


Figure 2: Difference in transmission when including magnetic fields. From this it can be determined that the PDT can be implemented in a region of relatively low magnetic field

Network News

Steering Committee and Supervisory Board Meeting held in Liverpool

The AVA Steering committee (SC) composed of Dr Michael Doser, Prof Eberhard Widmann, Prof Erich Griesmayer, AVA Fellow representative Milena Vujanovic, and the network coordinator, Prof Carsten Welsch, met on 27th June in Liverpool.

The role of SC is to review overall project progress and discuss any issues that may arise. The members were happy with the project progress to date and praised the high quality of research carried out by the AVA Fellows, noting that several high impact papers had already been published.

The rest of the meeting focused on planning future AVA events. The SC outlined a draft programme for the upcoming AVA School on Precision studies and Fundamental Symmetries, which will be held in Prague between 23-27 March 2020. The Committee also had initial discussions about the organization of the EXA conference as final AVA event in Vienna next year.

All suggestions from the SC meeting were presented on the next day to the AVA Supervisory Board which met right after the Symposium on Accelerators for Science and Society. All Fellows and their supervisors gathered to review the progress made and agree an action plan for the coming year.

Importance of antimatter research showcased at international Symposium



Leading researchers presented talks on a range of topics from big data to cancer treatment.

Particle accelerators have numerous applications across many fields including fundamental research, healthcare, electronics, environment and energy but, despite the significant role that accelerators play in our daily lives, the field of accelerator science and technology remains largely unknown to most people.

An international Symposium on 'Accelerators for Science and Society' that took place at the

Liverpool Arena and Convention Centre on Friday 28 June 2019, aimed to inspire students with the possibilities of this rapidly evolving field and provided insight into the economic, scientific and societal benefits of particle accelerators. The event was hailed a great success with delegates comprising of 100 researchers from across Europe and 150 students and teachers from local high schools.

Renowned speakers such as Dr Simon Jolly (UCL) and Prof Maria Fasli (University of Essex) gave insight into how particle accelerators are used for cancer treatment and how data plays a crucial role in accelerator-based experiments, as well as for society on a daily basis. Dr Michael Doser (CERN) gave a talk about why antimatter matters and explained the many challenges that are being addressed within the AVA project.



Dr Michael Doser discussing how scientists are trying to solve the antimatter mystery of our universe.

In addition, international best-selling author and educator [Curtis Jobling](#) highlighted the importance of art and thinking creatively alongside studying STEM subjects and how this combination drives innovation across society. Finally, [Prof Carsten Welsch](#) who leads the H2020 Marie Skłodowska-Curie training networks AVA and [OMA](#), as well as the doctoral training centre [LIVDAT](#) on big data science which are behind the event, presented the very successful approach to researcher training that was established through the [DITANET](#), [oPAC](#) and [LA3NET](#) projects and is now used for the three training programs that organized the event. All talks were [live-streamed](#) to institutions across Europe and are now available to watch via the [event website](#).

Researchers from all three initiatives presented their R&D in the form of posters and gave young delegates the opportunity to experience science up close through interactive demonstrations that the scientists developed specifically for this event.



Young delegates had the opportunity to experience science up close.

Professor Welsch said: “AVA has been training the next generation of antimatter researchers since 2017 and will produce experts that go on to work around the world in both, academia and industry. It is fantastic to see the outstanding research results that have stemmed from our three most recent training initiatives and how our Fellows engaged with the next generation of scientists and engineers at the Symposium.

The speakers provided an excellent overview of the many applications that particle accelerators have made possible in our everyday lives and in particular of how the use, handling and analysis of data impacts on science and society.”

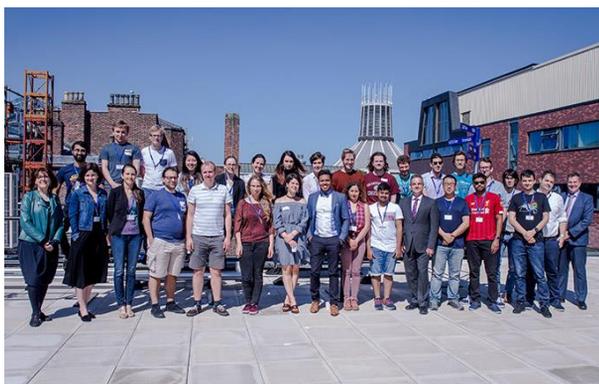


The Fellows presented their research.

More information and all talks can be accessed via the [event homepage](#).

AVA Advanced Researcher Skills School

All of the AVA Fellows attended an Advanced School on researcher skills training. The 4-day long event was held at the University of Liverpool between 23-27 June 2019. This intense School aimed at preparing them for their future career, whether that would be in academia or industry. They were also joined by Fellows from OMA ITN which provided an excellent networking opportunity. The first day morning was dedicated to tips and tricks for successful grant writing, whereas the afternoon covered discussions about differences between working in academia and industry.



AVA and OMA Fellows attending the School.

Tuesday focused on career planning through an engaging and thought-provoking session where the Fellows evaluated their own skills, desires and aspirations. They used this evaluation to identify career pathways that are suitable for them. The afternoon then targeted CV writing and job interview skills.

Science, business and outreach communication was the topic for Wednesday, where the Fellows learned how to present themselves in a concise, catchy and memorable way to a variety of different audiences, such as businesses, editors or school children.

The School was completed by a full-day training on international project management and communication, delivered by Dr Fraser Robertson from AVA partner Fistral. The Fellows collectively selected this as the best and most engaging session of the week and appreciated the opportunity to learn how to communicate with many different personality types.



Fellows evaluating their skills to discover their ideal career path.

Professor Carsten Welsch who developed the training concept as part of the previous [oPAC](#) and [LA3NET](#) networks, said: *“Throughout the week, we focused on the specific skills that researchers need in order to be successful in their work – independent on whether they target a career in academia or industry. The School gave many opportunities to discuss different career avenues, the challenges researchers find in different sectors, and to reflect on how the Fellows can use the skills that they have now developed within the AVA project to boost their employability.”* This approach to researcher training has been presented at a number of national and international learning and teaching conferences and will continue to serve as a model for future trainings.

Special thanks go to the Liverpool staff members who contributed to the training and the [Project TEAM](#) for their help in the organization!

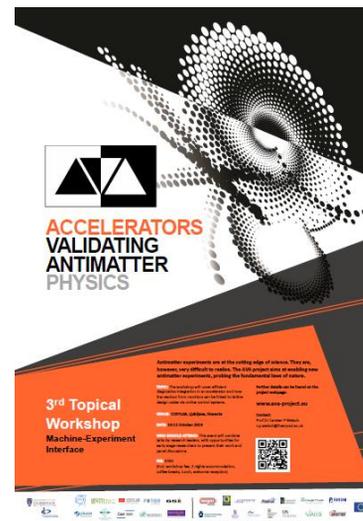
Upcoming AVA Event

3rd AVA Topical Workshop: Machine-Experiment Interface, October 2019

A two-day workshop on 'Machine-Experiment Interface' with a focus on efficient diagnostics integration in an accelerator and in particular the challenges that arise when interfacing stand-alone experiments with the wider accelerator control system. The event will be hosted by AVA partner COSYLAB in Ljubljana, Slovenia on 10-11 October 2019.

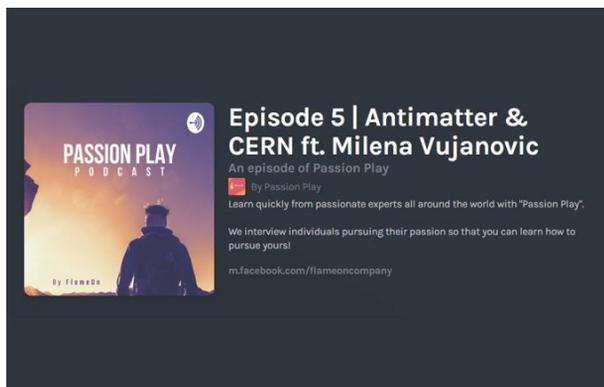
The workshop will combine invited talks about the current challenges at large scale facilities with a hands-on workshop in LabView and will otherwise focus on establishing a roadmap for efficient experiment integration and interfacing.

More information can be found on the event webpage: <https://indico.cern.ch/event/835785/>



Fellows Activity

How to make your dreams come true



"Passion Play" is a fun educational podcast hosted by Michael Jobity on streaming platforms. It explains to its listeners how they can pursue their passion by

interviewing passionate experts in a range of different fields.

In one of the [latest episodes](#), PhD student and AVA Fellow [Milena Vujanovic](#) who is based at the University of Liverpool / Cockcroft Institute, took listeners into the world of antimatter and explains her research within our network.

Not only does she explain her role as a physicist, but she also talks about how others can follow this journey as well! Milena also talks about her Marie Curie Fellowship, her blog, superheroes,... and cats!

Make sure you check out the podcast and let [Milena](#) know what you think.

Cosylab hosted 2 weeks secondment of AVA Fellow Indrajeet Prasad



Indrajeet Prasad at Cosylab.

Cosylab hosted 2 weeks secondment of AVA Fellow Indrajeet Prasad in Ljubljana, Slovenia.

Adélaïde Grimaud, AVA Fellow based at Cosylab, is developing a versatile control system that will communicate with the High Precision Power supplies being designed and built by Indrajeet at FOTON, s.r.o. in the Czech Republic. Therefore, it was mutually beneficial to work together in order to maximize the research outcomes of both Fellows. Secondments and research trainings at various partner institutions are an important part of Innovative Training Networks and this collaborative approach proved very useful and provided an excellent opportunity for wider learning and knowledge exchange.

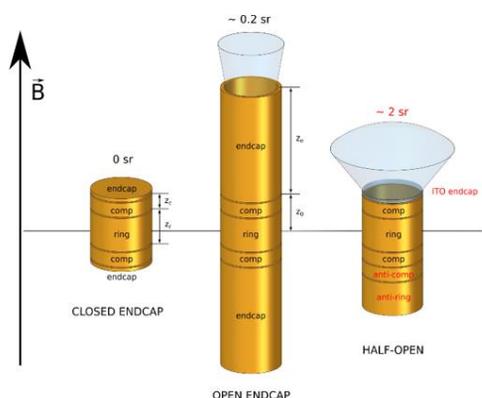
The aim of this secondment was to train Indrajeet on how to use Linux and the industrial control system EPICS (Experimental Physics and Industrial Control System). He was supervised by experts from the Cosylab team and supported by Adelaide. During the first week he learned the command language of Linux, how to use different widgets in graphical user interface and he also created an IOC

(Input/Output Controller) application in EPICS. His second week focused on communication between the server, control system and devices in EPICS.

This secondment brought two AVA Fellows to work together on a common goal and exchange knowledge to accomplish their interconnected project goals. Adélaïde is now planning to reciprocate the visit and do a secondment at FOTON in the near future to test her control system design on High Precision Power supplies.

Cosylab provides system integration and customer adapted products and solutions, covering the complete area of control systems and instrumentation. They are specialized in accelerators, both for particle therapy and scientific research, as well as tokamaks and radiotelescopes. The company has received several awards including *Best Slovenian Employer* in 2015 and the Experimental Physics Control Systems (EPCS) Award by the European Physical Society in 2001.

Results with Transparent Trapping Electrode presented at DPG Spring Meeting



The ITO enhances the observation angle of trapped particles by about a factor of 10 over traditional open-cap designs.

AVA Fellow [Jeffrey Klimes](#) (GSI) of the Antimatter Experiments work package, attended the 83rd spring meeting of the German Physical Society (Deutsche Physikalische Gesellschaft, DPG), where he presented the implementation of a transparent electrode for the charged particle trap ARTEMIS.

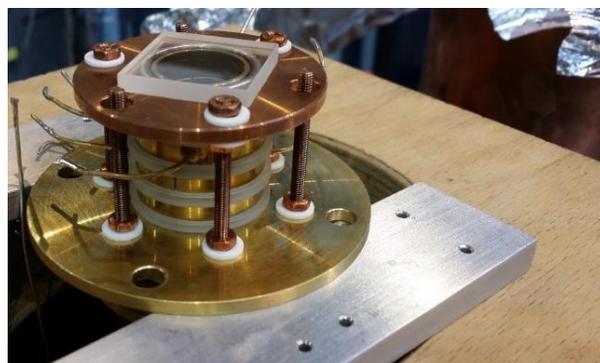


Hundreds of PhD students attend a plenary session at the 83rd DPG Spring meeting. Talks were broadcast over a closed-circuit to increase capacitance of attendees.

The meeting was attended by many senior physics and hundreds of doctoral candidates working on

atomic, molecular and plasma physics as well as quantum optics, and working groups focusing on energy science, industry involvement, and the physics of disarmament among many other topics. A highlight section included an in-depth discussion of the SI system of units and its future basis on purely fundamental constants of nature.

Hosted by Universität Rostock, the event consisted of 5 full days of seminars, invited and contributed talks and engagement activities. Between plenary talks and topical sections, industry spokespersons were invited to demonstrate marketed solutions to a wide range of experimental challenges.



Picture of ITO window placement in the ARTEMIS trap.

At the poster session, Jeffrey presented the so-called ITO window, which is the indium-tin-oxide coated glass that serves as the endcap electrode in the ARTEMIS experiment and allows a wide solid angle for fluorescence light detection. The window in ARTEMIS is pictured above. This is of great benefit to spectroscopy experiments in charged particles traps such as ARTEMIS, where the fluoresced light is emitted over a large angle. Maximizing the detectable light can greatly improve the signal-to-noise ratio and therefore the overall precision of such experiments.

AVA Fellow inspires Indian students to study in Europe

In a news story published last week, [Yahoo India](#) has showcased the inspiring story of how AVA Fellow [Indrajeet Prasad](#) is using social media to help Indian students to study in Europe.



"You don't need a fortune to study abroad" - Indrajeet Prasad

Indrajeet is reaching out to help Indian students to find a dream and cost-effective study opportunities in Europe. By having to go through the same route himself in the recent past, he is in the best position to give young people useful advice so they can

follow his footsteps. It is no surprise that this has earned him over 24,000 followers on Instagram ([@its_prasad_official](#)) and thousands of views of his very professional [youtube videos](#).

"I am really happy, overwhelmed and thankful to see such great response from media outlets to cover my initiative of helping Indian students. I am just learning the "art of giving", and hoping to help few deserving and talented students find their best scholarship to fund their higher studies in Europe." said Indrajeet when he realized that the article was quickly picked by other journals too (eg. [Verna Magazine](#), [GlobeStats](#), [Apsters Media](#), [Time Bulletin](#)) increasing the coverage even further.

Public engagement is an important and integral part of the training of all AVA Fellows. During their Fellowship they are expected to promote careers in science and engineering, their research results and interdisciplinary training to diverse audiences. In addition to articles like Indrajeet's, this has included for example [podcasts](#), contributions to [large scale outreach events](#), and [science short films](#).

Results from the Cold Cathode Test Bench presented at the IVNC-IVESC 2019

AVA Fellow [Bruno Galante](#) (CERN), attended the first joint meeting between the International Vacuum Nanoelectronics Conference (IVNC) and the International Vacuum Electron Sources Conference (IVESC) in Cincinnati, Ohio, 22-26 July 2019. The leading experts in the field of electron emission (namely field emission, thermionic emission and photoemission) gathered in Cincinnati to discuss and present the latest technologies and results regarding novel electron emission processes and applications.

Bruno presented the latest results obtained from the cold cathode test bench, which investigates cold electron emission sources. These studies aim to design and build a cold cathode electron gun with the goal to optimize and improve the electron

cooler of ELENA (Extra Low Energy Antiproton facility) replacing the currently used thermionic electron gun.

The event was hosted by the University of Cincinnati, Ohio and lasted 5 full days rich of seminars, discussions and also a series of mini-courses covering theory and experiments. The whole conference was enriched by networking activities as a welcome drink, conference dinner and an excursion to the US Air Force museum. Moreover, the presence of experts from several sectors such as -universities, research centres and industry- assured to have a wide spectrum of the most advanced experimental setups and novel materials for the generation of electron beams.

On the fourth day, Bruno showcased the highlights of his AVA project and his latest results in an oral presentation entitled "Generation of cold electron for an eV electron cooler". It was very encouraging to see that the use of carbon nanotubes as electron emitters is attracting lot of attention worldwide thanks to their very promising properties. Bruno's results help to broaden even further our knowledge

about this novel material and its performances, especially for what concerns stability issues and long-term measurements. The design of a carbon nanotube cold cathode electron gun is very beneficial due to the possibility to even further optimize the electron cooling performances at low energies.

Presentation of Sympathetic Cooling at NACTI



View of Washington Monument and Capitol during NACTI conference excursion to the National Mall in Washington DC.

The development of sympathetic cooling of single particles constitutes a major effort within the BASE collaboration to advance their experiments on protons and antiprotons. Cooler particles will allow the application of new measurement methods and therefore enable more precise tests of the fundamental interactions with protons and antiprotons.

AVA Fellow [Markus Wiesinger](#), member of the BASE collaboration, recently presented his research at the 2nd North American Conference on Trapped Ions (NACTI), which was one of this year's outstanding meetings of the international experts on trapped ion physics. His contribution „Towards Sympathetic Cooling of Single Protons and

Antiprotons“ was selected by the Program Committee as a „hot-topic“ and he was given the opportunity to give a talk in addition to a poster presentation.

„The NACTI conference was a great experience and allowed me to learn a lot from amazing talks about trapped ions.“, Markus explained enthusiastically. „It was very motivating to receive a lot of feedback on and recognition of my work within BASE from other trap-experts on the NACTI conference“. Within his AVA-project, Markus is developing, as a Member of the BASE-Mainz team, a new double-trap system to couple protons and laser-cooled beryllium ions via image currents to sympathetically cool protons to mK temperatures.

Siara Fabbri learnt about plasma at Culham Science Centre

AVA Fellow [Siara Fabbri](#) (UoM) of the Antimatter Experiments work package attended the 56th Culham Plasma Physics Summer School at the Culham Science Centre in Oxfordshire, where she learned from experts in their fields on the fundamental principles of plasma physics. The topics taught in this school, such as magnetohydrodynamics (the study of the magnetic properties and behaviour of electrically conducting fluids), can directly be applied to her research which focuses on cold, dense antiproton plasmas. Siara presented her work during the poster session.

The Culham Centre for Fusion Energy is a leading site for research in plasma physics and controlled nuclear fusion. It is home to JET, the world's largest and most powerful tokamak, and Mast, one of the world's two leading spherical tokamaks. One of the main highlights of the school was the tours of JET and Mast.

One day of the school was held at Rutherford Appleton Laboratory, where the Diamond Light Source exists. Students attended a tour of the Vulcan, a high power laser capable of delivering ultra-high focussed intensities greater than 10^{21} Wcm⁻², making it the highest-intensity focussed laser in the world in 2005.

One of Siara's favourite aspects of the school was learning about the many different types of plasmas which exist, from the cold, dense plasmas she is more familiar with, to massive, hot space plasmas and the plasmas inside the sun. The premises on which the program was held meant that a large focus of the school was fusion physics and the future of fusion energy. As such, students were educated on ITER, the largest fusion experiment in the world, which is currently being built and will rival CERN in terms of technological advancement.



Left: Siara in front of a 3D rendering of the inside of JET. Jet is still operational, so students could not go beyond the large cement radiation barriers. The pink fluorescent streaks are what an actual JET plasma looks like. The pink light is emitted from unionized atoms which exist in lower energy regions, whereas particles in the middle of the toroid emit no light because they are at higher energy and therefore fully ionized.

Right: 3D model of the JET tokamak.

Partner News

Experience Science - Open Day at Forschungszentrum Jülich

Forschungszentrum Jülich in Germany (FZJ) is one of the biggest research centers in Europe. On Sunday, 7th July 2019, it was open to the public, hosting more than 28000 visitors.

'Tag der Neugier' - the German name of the event translates to a 'Day of Curiosity'. And that was accurate! Guests could listen to talks, observe demonstrations, participate in hands-on activities and learn about the experiments carried out on-site and visit the experimental facilities. Some of the attractions were designed especially for children.



The activities were divided into sections which reflect the diverse disciplines present at FZJ and challenges that researchers are facing now: environment and climate, energy and matter, data science and life sciences. Furthermore, in the Research Café there was a chance to chat with scientists in an informal environment, in the Future Library guests could experience virtual reality and for those interested in practical aspects of daily life at FZJ the fire brigade, safety and security groups were there to explain their routines. Last but not least, a series of events was prepared to showcase the connections of FZJ with a local community and global research.

The Nuclear Physics Institute at Forschungszentrum Jülich (IKP), a host institution

for AVA Fellow [Dominika Alfs](#), guided visitors through basic concepts of particle physics: from a simple detector to a big experiment. Guests were challenged to perform some measurements on their own. They could, for example, measure their hair thickness by the diffraction pattern of a laser beam or detect and visualise cosmic radiation particles with scintillators and cloud chambers. It was explained how the detectors they used are then built into big experimental setup. To complete the picture, tours to a Cooler Synchrotron (COSY) - a particle accelerator and a storage ring for protons and deuterons operated by IKP were offered.

"I had a chance to see how this kind of event is planned and prepared. Even though on the day of event everything seemed to be happening almost effortlessly, it required a lot of work beforehand. It was interesting to participate in preparation of the experiments - I realised that making them work is simply not enough - they need to grab visitors' attention and give us a chance to share our knowledge and excitement in the meantime." - said Dominika.

More information about the Open Day and FZJ can be found here:

<http://www.tagderneugier.de>

<https://www.fz-juelich.de>





Position Vacancies

Lecturer in Accelerator Physics at University of Liverpool / Cockcroft Institute

The University of Liverpool is seeking to recruit an outstanding candidate for a permanent Lectureship in the area of Accelerator Science with a specialisation in Free Electron Lasers. The UK is strongly involved in FELs around the world, including the XFEL in Germany, FERMI in Italy, SwissFEL and LCLS in the USA. Furthermore, establishing a Free Electron Laser in the UK is an expressed priority in terms of future research infrastructures. The UK is also home to the CLARA accelerator at Daresbury Laboratory which provides unique R&D opportunities to enhance FEL performance.

This post will focus on R&D into FEL design and optimisation, critically examining performance enhancements in terms of achieving the best FEL output stability shot to shot, generation of flexible FEL output pulse structures, ultra-short photon pulses, and enhanced FEL output. Other areas of study include enhancements of peak power, generation of useful higher harmonics, as well as polarisation control.

Longer term and as part of their career development, the post holder will be expected to engage with the wider user community in terms of beam line design and optimisation, as well as experiment design and optimisation, thus exploiting the existing contact network of the Cockcroft Institute, Physics Department and the UK.

Candidates should have an excellent track record in accelerator science at international level supported by publications in refereed journals and other appropriate esteem factors such as invitations to speak or positions of responsibility. Experience in undergraduate and postgraduate teaching is highly desirable.

Closing date: 30 September 2019

More information can be found [here](#)



News from FAIR

University of Liverpool has just signed a comprehensive Memorandum of Understanding (MoU) on research collaboration in scientific domains of mutual interest with the GSI and FAIR. GSI/FAIR and the Department of Physics at the University of Liverpool have been collaborating on a number of research topics for a long time.

This includes R&D into superheavy elements, nuclear structure, low energy antiproton and ion physics, material studies with heavy ions, medical applications of charged particle beams, normal and superconducting accelerator techniques, beam instrumentation and sensors, as well as accelerator design, control and optimisation. The organisations have also jointly trained generations of early stage researchers through the European projects DITANET, oPAC, OMA and – of course – AVA.

This new MoU is an excellent example of new research opportunities that become available through the structure of our network.



Signpost on the roof-top of the Liverpool physics department.

AVA Events

9 th – 10 th October 2019	3 rd Topical Workshop on Machine-Experiment Interface, CosyLab, Slovenia
23 rd -27 th March 2020	2 nd AVA School on Precision Studies, Prague, Czech Republic
September 2020	EXA/AVA Conference, Vienna, Austria

Other Events

May 10 th – 15 th 2020	IPAC20, Caen, France
Aug 30 th - Sept 4 th 2020	LINAC2020, Liverpool, UK

Notice Board

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

DEADLINE FOR THE NEXT NEWSLETTER CONTRIBUTIONS: 5th December 2019



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