



Ready to make great things happen

Highlights

- OMA Complementary Skills School in Liverpool
- Meet our Fellows
- Upcoming OMA Events

The first OMA School on Researcher Skills took place in Liverpool in early April. It was the first event of our network which brought together all of our Fellows. It was some sort of a magical moment: The OMA project idea had been prepared mostly back in 2015, the project officially started in 2016 and only in 2017 did our Fellows come together in the same room for the first time. During the whole week we worked together on a range of skills that are relevant for researchers – from presentation skills to project management and commercialization. Maybe even more important, we worked on becoming a real network, understanding each other's background, research project and goals. As so often in the past, Liverpool provided an ideal environment for us to work together closely. We had a wonderful time together and I am now looking forward more than ever to the many things that await us during the course of our project.

It won't be long until we meet again! The Liverpool Project TEAM including the OMA Project Manager, as well as a number of OMA Fellows and myself will all attend the IPAC conference. The world's largest particle accelerator conference will this year take place in Copenhagen, Denmark. There will be several contributions to the scientific programme by the network, including a poster about the OMA network on the Thursday afternoon. What's more, our **OMA brochure** will be launched at the conference – an important milestone for the project and fantastic read. To get your own copy, please come and see us any time during the week at **booth #20**.

Just a few weeks later we will all meet again during our OMA School on Medical Accelerators. Fully booked, with fantastic speakers lined up this has all the ingredients to become another highlight for our quickly growing network...



Prof Dr Carsten P Welsch,
Coordinator

Network News

OMA Complementary Skills School in Liverpool



The OMA Fellows gathered in April for the first OMA training event organized at the University of Liverpool. They were joined by four AVA Fellows, to start collaboration between the two Marie Curie networks. An intense training programme was focused on complementary skills and included team – building activities.

The first day began with OMA Coordinator Prof Welsch presenting the basics of the OMA and AVA networks, as well as tips for scientific presentations, to be used later in the week. This was followed by Fellows' creative introductions, letting them get to know each other. The afternoon session on science communication was delivered by Ms. Rachel Holdsworth and Ms. Elsa Loissel from Holdsworth Associates, who provided tips for targeted writing about science. In addition, on the first day the participants were divided into

three sub-groups, to start working on the week challenge – outreach project proposal, based on their own outreach ideas.

Tuesday followed an intense training on project management, delivered by Dr. Fraser Robertson from Fistral. The fellows learned how to apply project management methodology to their research projects and started to work on their outreach project ideas. This was followed by a workshop on research commercialisation by Ms. Kate Lowes from Inventya and a talk by Dr Alexandra Alexandrova, former LA³NET Fellow and owner of the D-beam company, who shared her own experience. The day concluded with a public talk by Dr Simon Jolly from the University College London, presenting *Treating Cancer with Accelerators*.





Wednesday started early as the participants set off to the Cockcroft Institute in Daresbury. The morning was devoted to practical presentation skills training in sub-groups, which included video recording and feedback from supervisor and other fellows in the room. In the afternoon the group visited Daresbury accelerator labs, which was preceded by an overview talk by Dr Lee Jones from the Cockcroft Institute. After the busy day the group enjoyed a social evening out at the go-karting track in Warrington, full of fun and friendly competition.



The following day, the Fellows were introduced to Intellectual Property Rights by Mr. Richard Bray, Patent Attorney from Appleyard Lees. Afterwards, OMA Project Manager Magda Klimontowska gave a

presentation on practical aspects of a European Training Network, and Prof Welsch presented important tips on international collaboration. The Fellows spent most of the day working in sub-groups, finalizing their proposals and organizing their group work within a very challenging time frame.

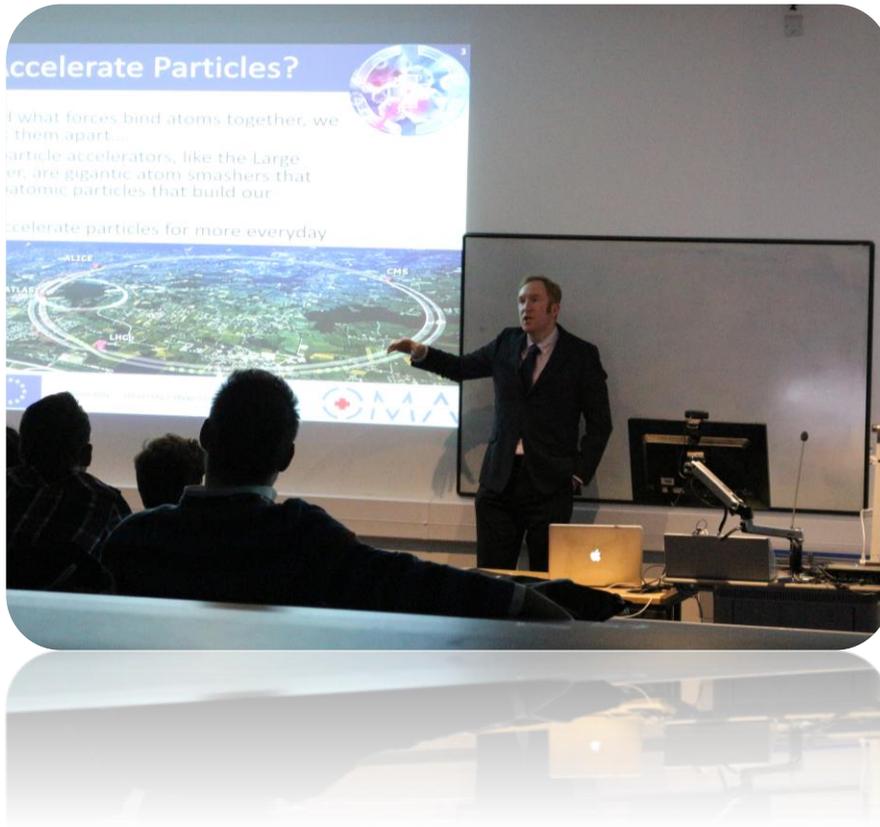


The last day of the school was focused on presentations of the outreach projects by each group and a peer-review process. In the morning Dr Dave Joss from the University of Liverpool gave a talk about the rules of peer-review, which later helped to discuss and evaluate each project, as well as vote for the best outreach proposal. The school was concluded by Prof Welsch, who summarised the Fellows' achievements of the whole week.



Treating Cancer with Particle Accelerators

- Public talk by Dr Simon Jolly, UCL



Dr Simon Jolly from the University College London gave a public talk at the University of Liverpool on the 4th of April. It took place during the week of the OMA School, facilitating participation of the OMA Fellows together with members of public.

In his talk Dr Jolly introduced some of the ways that particle accelerators are used in cancer

treatment, from the most common radiotherapy gantries to the more advanced technology needed for proton beam therapy. He also explained how we use beams of radiation to treat cancer effectively and why the machines needed for proton beam therapy are so large and complex, along with a sneak peak at the NHS' new proton beam therapy facilities in the UK.

OMA represented at EuCard-2 Workshop on Innovative Delivery Systems in Particle Therapy



Participants at EuCard-2 Workshop on Innovative Delivery Systems in Particle Therapy (Image courtesy of organizers)

EuCard-2 Workshop on Innovative Delivery Systems in Particle Therapy took place at Molecular Biotechnology Centre in Torino, Italy, between 23rd and 25th of February 2017. The workshop covered multiple subjects and was split into sessions related to current status of dose delivery systems and new challenges in the field, dose verification, organ motion strategies or new accelerators for particle therapy.

It was also an academia-industry matching event and thus a few commercial representatives were invited, i.e. Hitachi, Toshiba, Mevion, IBA etc. On the last day of workshop, a guided tour to the CNAO centre in Pavia took place.

Dr Christian Graeff from GSI, a member of the OMA Steering Committee, presented a talk on 4D-optimization and motion-synchronized delivery. The basic idea of 4D-optimization is to prepare not a single plan for the treatment, but

one for each of a set of motion states. Each of these plans can then target the tumour only, so that no excessive normal tissue is irradiated. During the treatment, the delivery has to be synchronized to the target motion – which is a challenge, as current dose delivery systems do not support this kind of feature. Realization of such a 4D dose delivery system is a focus of the OMA ESR project carried out at GSI.

Ewa Oponowicz, OMA Fellow hosted by the University of Manchester/ Cockcroft Institute, gave a talk on research activities carried out in the field of proton therapy in the U.K. The speech focused mainly on the research on high energy proton beams (330-350 MeV) for proton computed tomography. It also covered update on the new NHS proton therapy centres being built in England, at the Christie Hospital in Manchester and at the University College London Hospital that will be made available for patients in 2018 and 2019 relatively.



Meet our Fellows (cont.)

Meet Michelle and Sudharsan – the Fellows who joined us in January.

Welcome to OMA!

Michelle Lis

Michelle studied physics and molecular biology at Loyola University Chicago. She obtained her Bachelor's degree in 2014. During her studies, she performed research on quantifying image distortions and treatments planning errors in MRI scans due to patient motion, at Loyola University Medical Center in Maywood, Illinois. She continued her education at Louisiana State University, a CAMPEP accredited university, where she was accepted into the Medical Physics program in 2015. Her research focused on developing a physics-based model for low doses due to patient scatter and the risk on developing secondary cancers.

In January 2017, Michelle joined the OMA project at GSI to work on developing a 4D-optimized dose delivery system for scanned carbon ion beams. This research will allow her complete her PhD at LSU.

Project:

[R&D into software solutions for a next generation dose delivery system](#)



Sudharsan Srinivasan

Sudharsan graduated as a mechanical engineer from National Institute of Technology, Raipur, India in the year 2011. During his bachelor's studies, he worked at Indira Gandhi Centre for Atomic Research (IGCAR), India under Indian National Academy of Engineering (INAE) summer fellowship on artificial neural network modelling of welding joints.

After obtaining his bachelor's degree, Sudharsan worked at Coal India Limited as an assistant manager for two years. In 2013, he started his master's studies in nuclear applications at the University of Applied Science Aachen, Germany. His master thesis project was carried out at the Institute for Nuclear Physics, Forschungszentrum Juelich, Germany. His study focused on fundamentals of nuclear physics and detector technology with the emphasis on medical applications. The work was to design and construct an

automated test bench to calibrate beam position monitors (BPMs) for the HESR in Darmstadt. In 2016, Sudharsan graduated with a master's degree specialized in medical physics.

In January 2017 Sudharsan joined the OMA project at Paul Scherrer Institute. His project focuses on developing a sensitive RF based current monitor for non-destructive beam current measurements at very low beam intensities. Emphasis will also be placed on the possibility to measure beam position.

Project:

[RF-based measurement of ultra-low charges](#)



Upcoming OMA Events

1st OMA School - Medical Accelerators

5th – 9th June 2017 , Fondazione CNAO, Pavia, Italy

Registration is now closed for the OMA School on Medical Accelerators.

Renowned lecturers will complement partner expertise to cover topics such as beam generation, transport and delivery to the patient, as well as treatment schemes, beam extraction and clinical assessment of effectiveness. Current challenges related to beam diagnostics, imaging and patient issues will also be discussed.

In addition to the lectures there will be study groups, a poster session and a dedicated industry session. There will also be opportunities for discussion and networking at evening events, and a study tour to CNAO facilities.

Within the School the OMA Scientific Board annual meeting and the OMA Steering Committee meeting will take place.

For information on **accommodation & directions** to CNAO please check:

<https://indico.cern.ch/event/595518/>



2nd OMA School – Monte Carlo Simulations

6th - 10th November 2017, LMU Munich, Germany

followed by

OMA Mid-term Review Meeting

13th November 2017, LMU Munich, Germany

Monte Carlo Simulations School will focus on theory of simulation tools, analysis and data visualisation in relation to treatment planning, and it will include sessions of hands-on training. The School is obligatory for all OMA Fellows and will be open to a limited number of external participants.

The **Mid-term Review Meeting** will take place on the Monday of the week following the

school. It is a very important meeting for the project evaluation, attended by the Project Officer on behalf of the European Commission. The project progress in different areas will be discussed and followed by feedback from the PO. **The meeting is obligatory for all OMA Fellows, who will present their progress, all OMA SC and SB members should also attend.**

Other Events

OMA at IPAC'17

OMA will be present at the 8th International Particle Accelerator Conference (IPAC) which takes place this year in Copenhagen, Denmark, from 14th to 19th May.



56th Annual Conference of the Particle Therapy Co-operative Group (PTCOG56)

PTCOG56 will take place from 8th to 13th May 2017 at the Makuhari Messe (Chiba Prefecture) and Pacifico Yokohama (Kanagawa Prefecture) in Japan.

The agenda will focus on educational workshops and scientific meetings that will be meaningful and productive for all involved in the field of particle radiotherapy. The main theme of PTCOG56 is "Ion-beam Radiotherapy in the 21st Century: Accuracy and Efficacy".



VHEE'17: Very High Energy Electron Radiotherapy: Medical & Accelerator Physics Aspects Towards Machine Realisation

The workshop will be held at the Cockcroft Institute of Accelerator Science and Technology in the UK from Monday the 24th of July 2017 until lunchtime of Wednesday the July 26th.

The purpose of this workshop is to explore a range of medical, RF and beam dynamics issues associated with the realisation of a machine for radiotherapy treatment. This machine is intended to deliver high dose, rapidly and precisely.

A series of invited plenary talks will be given in addition to contributed working group papers. This will be a unique opportunity for accelerator physicists working on beam

dynamics and structure design to interact with medical physicists and oncologists to explore the potential for a new paradigm in cancer treatment. Early registration is advised: <https://eventbooking.stfc.ac.uk/news-events/very-high-energy-electron-radiotherapy-vhee-372>



2017 International Beam Instrumentation Conference (IBIC 17)



IBIC 17 takes place in Grand Rapids, Michigan, USA, on 20th - 24th August 2017.

IBIC is a gathering of the world's beam instrumentation community and is dedicated to exploring the physics and engineering challenges of beam diagnostic and

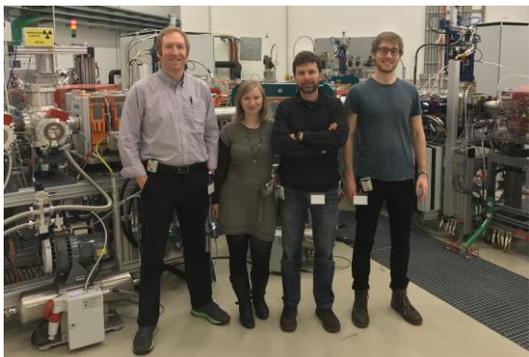
measurement techniques for particle accelerators worldwide.

The OMA coordinator will represent the project at the conference and industrial exhibition. **You can visit us at booth #107.**

Fellow News

Collaboration between UCL and MedAustron

Laurent Kelleter, OMA Fellow based at University College London, assisted in conducting the first test of the equipment at high proton energies at the OMA partner facility MedAustron. In the first week of March, a team from UCL, led by Dr Simon Jolly, had the opportunity to make measurements of the MedAustron clinical proton beam with their prototype proton calorimetry detector.



The goal of the UCL project is to adapt existing high energy physics detector technology for the precise measurement of proton energy in a clinical setting. This would allow improved verification of the proton beam energy and range during daily Quality Assurance (QA) checks and could also provide the energy measurement stage for a proton CT imaging system. In the past, detector performance tests have been conducted with the 60 MeV proton beam at the Clatterbridge Cancer Centre in the UK, a partner organisation of the OMA network. In contrast, the MedAustron research beamline provided the opportunity to make measurements at energies up to 252 MeV for

the first time. Another first was that the UCL group were the first external collaborators to make use of the MedAustron research beamline: as such, the visit was highly anticipated by everyone involved. As well as a tour around the brand new facility, the MedAustron Medical Physics team also provided the opportunity for observing the morning in-room QA procedures, something of particular relevance to the UCL detector. In addition, Simon gave a talk about the proton calorimetry research project at UCL and the current status of proton beam therapy in the UK. Measurements were made with the detector during two night shifts: first to establish the necessary experimental beam conditions; then to characterise the performance of the detector at a range of energies up to 252 MeV. In addition, the high rate performance of the detector was also tested to determine the rate limit with the existing setup.

The preliminary results show promising behaviour of the detector even in the upper range of clinical relevant proton energies. An energy resolution below 1% FWHM at higher energies confirmed the most optimistic expectations, as well as matching extremely well with detector simulations carried out before the trip. Further analysis especially on the rate-dependent performance is ongoing. We are very thankful for the huge support we received from MedAustron staff, including **OMA Fellow Andrea de Franco**, and we are looking forward to a close collaboration in the future.



A visit to Clatterbridge Cancer Centre

OMA Fellows Jacinta and Ewa recently visited the Clatterbridge Cancer Centre (CCC) in Liverpool. Clatterbridge is home to the first proton beam therapy facility in the world and is also currently the only operating cancer center in the UK. Since 1989, thousands of patients from all over the world have sought treatment at CCC for ocular cancer.

The day visit was led by Dr Andrzej Kacperek, head of the Douglas Cyclotron who gave an overview of the facilities, treatment process, as well as a tour of the treatment room and cyclotron bunker. CCC is involved in several multidisciplinary projects and Dr Kacperek also provided an introduction to the ongoing work and research.

Overall, it was an enlightening experience to see behind the scenes of the clinical environment and the technology required to make treatment possible. Being able to tour the rooms and talk with Dr Kacperek and fellow colleagues was also an invaluable opportunity as Jacinta will return in the future to carry out experiments and secondments as part of her OMA project. By the end of the day everyone left with a lasting impression - it is remarkable that for more than 30 years, proton therapy has been successfully treating eye cancers here in North West England. Since its beginnings, much of the expertise, research and development have originated from on site and no doubt, there will be more to come.

OMA Fellow at JUAS

The OMA Fellow, Jacinta Yap, recently attended the second Joint Universities Accelerator School run by the European Scientific Institute. The second course had a strong focus on the technology and applications of particle accelerators, covering many of the practical aspects involved with accelerators. Full day lectures were held for the first 4 weeks along with ongoing lab reports, presentations and exams in the last week. Jacinta attended the course with more than 30 other masters, PhD students and working professionals of all different backgrounds from around the world.



Accommodating for different fields of work within accelerator physics, the school taught a broad range of topics as well as additional seminars. In the first weeks students were given lectures about radiofrequency (RF) cavities, vacuum systems, beam instrumentation, superconducting RF, accelerators for hadron therapy and control systems. This was followed by magnets, superconducting magnets, particle sources, low energy electron accelerators, accelerators for industrial and medical applications, life-cycle and reliability, high current proton linacs and radiation safety. Students were also given the opportunity to visit CERN, PSI, Bergoz instrumentation and Geneva hospital for tours of the facilities and practical work. These were the highlight of the course for Jacinta, hands on sessions with real equipment and being able to see in person places that she'd only read about!

It was an intense month of accelerator applications boot camp but Jacinta enjoyed her experience, met many others in the field and learnt much more about accelerators.

Partner News

The Cockcroft Institute celebrates three major milestones



The Cockcroft Institute for Accelerator Science and Technology has celebrated its partnership, new core funding and new laboratories and office space as it relocated to its new building in the heart of STFC's Daresbury Laboratory.

With the accession of the University of Strathclyde to full membership of the CI, the institute has grown very significantly and it has gained a number of additional and complementary skills which allow the institute to tackle an even broader range of accelerator R&D challenges.

The commencement of the Institute's new STFC core funding provides important support for the institute to pursue its research goals. Across its four stakeholder universities, the institute will continue to be supported by STFC with more than £2M of funding per year.

Finally, moving on to the main Daresbury Laboratory site brings members of the [Cockcroft Institute](#) and its PhD students conveniently closer to the world leading particle accelerator research facilities, most notably 'VELA', which is making world leading accelerator technology available to UK industry,

and 'CLARA', which is meeting the technological challenges that are paving the way for the UK's next generation of accelerator technology.

Professor Carsten Welsch, Head of the Physics Department and the Liverpool Accelerator Science Group, said: *"The Cockcroft Institute has come a long way since its foundation more than 10 years ago. With renewed core funding, new facilities and the additional expertise at the University of Strathclyde we are now even better placed to carry out accelerator R&D at the cutting edge of science and technology. The Liverpool group has initiated and coordinated a number of large scale research projects such as oPAC, OMA and AVA which have been vital for the success of the institute."*

This special event was well attended by delegates from all CI stakeholders, external collaboration partners, representatives of STFC – and three generations of the Cockcroft family. It saw presentations by key scientists, outreach demonstrations, and tours of the on-campus accelerator facilities.



Selected Publication

Results from Laurent Kelleter's previous collaboration:

Spectroscopic study of prompt-gamma emission for range verification in proton therapy, Laurent Kelleter, Aleksandra Wrońska, Judith Besuglow, Adam Konefał, Karim Laihem, Johannes Leidner, Andrzej Magiera, Katia Parodi, Katarzyna Rusiecka, Achim Stahl, Thomas Tessonnier, *Physica Medica*, Volume 34, February 2017, Pages 7–17 <http://doi.org/10.1016/j.ejmp.2017.01.003>

Vacancies



Early Stage Researcher Fellowships within the AVA project

Application deadline: 31st May 2017

More information can be found here: <https://www.liverpool.ac.uk/ava/vacancies/>

15 Studentships in the Liverpool Centre for Doctoral Training on Big Data Science (LIVDAT)

More information can be found from early May on <http://www.livdat.org>

Accelerator Scientist at Cornell Laboratory

More information can be found here: <https://academicjobsonline.org/ajo/jobs/8866>

Tenure-track position on frontier research on heavy nuclei

Application guidelines at: http://www.mext.go.jp/component/a_menu/science/detail/_icsFiles/fieldfile/2017/03/06/1381348_1_2_1.pdf

OMA Events

June 5 th – 9 th 2017	1 st OMA School – Medical Accelerators, CNAO, Pavia, Italy
Nov 6 th – 10 th 2017	2 nd OMA School – Monte Carlo Simulations, LMU Munich, Germany
Nov 13 th 2017	OMA Mid-term Review Meeting, LMU Munich, Germany

Other Events

May 8 th – 13 th 2016	PTCOG56, Pacifico Yokohama, Japan
May 14 th – 19 th 2017	IPAC'17, Copenhagen, Denmark
May 29 th – June 2 nd 2017	FCC Week 2017, Berlin, Germany
June 1 st 2017	Libera Workshop 2017, Slovenia
July 24 th – 26 th 2017	VHEE'17, Daresbury, UK
August 20 th – 24 th 2017	IBIC'17, Grand Rapids, MI, USA

NOTICE BOARD

DEADLINE FOR THE NEXT NEWSLETTER **30th June 2017**



Project Coordinator
Prof Carsten P. Welsch
carsten.welsch@cockcroft.ac.uk

Project Manager
Magdalena Klimontowska
magdalena.klimontowska@cockcroft.ac.uk

Newsletter Editor
Alexandra Welsch
alexandra.welsch@cockcroft.ac.uk

