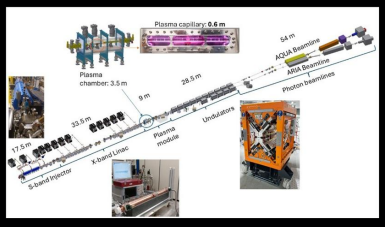
EuPRAXIA Doctoral Network

>>> Newsletter

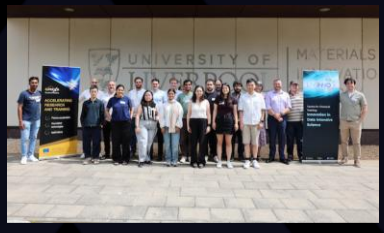
Latest developments in plasma accelerator research and training.

>>> Highlights



EuPRAXIA@SPARC_LAB: Technical Design Report Published

EuPRAXIA puts Sustainability at the Heart of Innovation



Advanced skills training for LIV.INNO and EuPRAXIA-DN students

>>> Welcome

Exciting events for the plasma accelerator community

It was a great pleasure to welcome all of our EuPRAXIA-DN Fellows at the Cockcroft Institute in the UK. We spend two excellent weeks together, discussing career opportunities, advanced project management techniques, and also how we can communicate the science and technology of plasma accelerators to diverse audience.

Our Symposium on Innovations for a Sustainable Tomorrow in the Spine was a real highlight. More than 100 participants created a buzzing atmosphere that allowed us to look into the best ways to transfer cutting-edge technology innovations to a wide range of applications, from medical to energy and materials.

We are now very much looking forward to our final conference on the beautiful island of Elba, and toget an insight into the scientific results of our Fellows.

Until then – enjoy the summer!

Prof Carsten P. Welsch
Coordinator

>>> Research Highlights

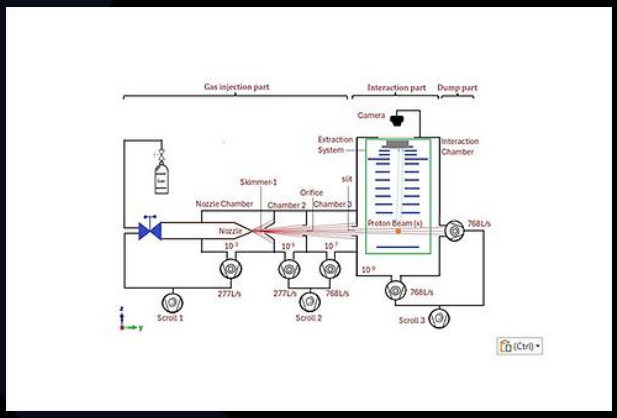
Progress Toward Beam Diagnostics for FLASH Proton Therapy

A publication from the University of Liverpool's QUASAR Group reports the design and characterization of an advanced extraction system for a Supersonic Gas Curtain–based Ionization Profile Monitor (SGC-IPM), contributes to the development of beam diagnostics for FLASH proton therapy.

The work has been published in the open-access journal Instruments under the title "Characterization of the Extraction System of Supersonic Gas Curtain-Based Ionization Profile Monitor for FLASH Proton Therapy."

Led by EuPRAXIA-DN Fellow and QUASAR member Farhana Thesni and QUASAR Dr Narender Kumar, the research presents the detailed CST simulations of the extraction system developed by our group (proceedings IPAC 2024) to verify the SGC-IPM's capability to simultaneously measure two-dimensional transverse beam profiles and beam position. This dual functionality is a critical requirement for next-generation medical accelerators operating at ultra-high dose rates.

FLASH radiotherapy poses a major diagnostic challenge, as conventional beam monitoring techniques often fail or significantly perturb the beam under extreme dose-rate conditions. The Supersonic Gas Curtain Ionization Profile Monitor offers a promising non-perturbative solution, enabling real-time monitoring without compromising beam quality.
In the study, comprehensive electrostatic and particle-tracking simulations of the extraction system were benchmarked against experimental measurements using a 28 MeV proton beam at the University of Birmingham. The authors systematically investigated the impact of beam size on profile reconstruction, quantified electric-field uniformity, and demonstrated reliable beam position monitoring. Additional factors, such as the influence of the tilted gas curtain, gained ion energy and its spread, and microchannel plate (MCP) detection efficiency, are analysed and will inform future design advancements.



Schematic of SGC-IPM (Extraction system highlighted in green box). (Image credit: Parambil, F. T. M., et al, Instruments, 10(1), 4, CC BY)

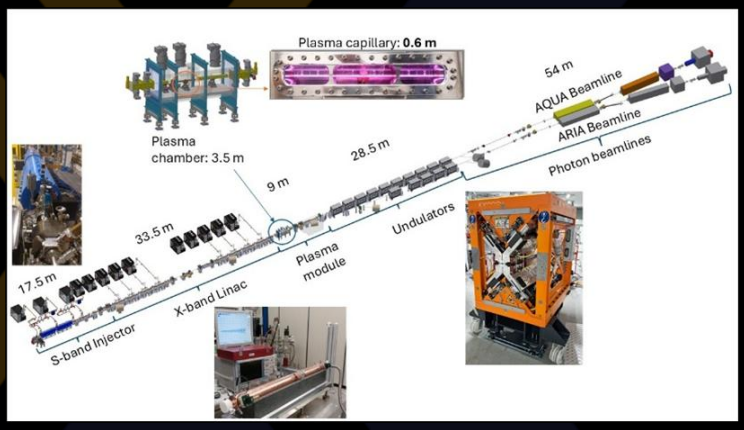
The results are highly encouraging. Simulations show robust reconstruction of transverse beam profiles across a wide range of beam sizes, along with a clear and linear response to intentional beam position offsets. The simulated characteristic drift induced by the supersonic gas flow was found to be in strong agreement with experimental measurements. These findings strengthen the case for the SGC-IPM as a powerful diagnostic tool for future medical and laser-driven accelerator facilities.

The study highlights the growing maturity of SGC-IPM technology and its potential to meet the stringent demands of next-generation radiotherapy.

Dr Narender Kumar, who has led the development of this technology over the past five years, commented: "This marks further progress towards beam diagnostics for medical accelerators, particularly for FLASH proton therapy. The work aligns closely with clinical diagnostic requirements, enabling simultaneous two-dimensional transverse profile and beam position measurements over a wide range of beam sizes. Going forward, these results will help optimize the SGC-IPM design and facilitate its easier integration into medical accelerator systems."

Further reading:
Parambil, F. T. M., et al., 'Characterization of the Extraction System of Supersonic Gas Curtain-Based Ionization Profile Monitor for FLASH Proton Therapy', Instruments, 10(1), 4 (2026). https://doi.org/10.3390/instruments10010004

EuPRAXIA@SPARC_LAB: Technical Design Report Published



Overall layout of the EuPRAXIA@SPARC_LAB accelerator.

With the publication of the Technical Design Report (TDR), EuPRAXIA@SPARC_LAB takes a decisive step toward the realization of the world's first user facility based on plasma acceleration.

The project, led by the INFN National Laboratories of Frascati, defines in detail the construction of a compact 1 GeV accelerator that integrates X-band RF technology and beam-driven Plasma WakeField Acceleration (PWFA), with the goal of realizing a Free Electron Laser operating in the *water window*, beamline AQUA in the figure, a strategic spectral region for applications in biology, materials science, and life sciences. The project is funded by the Italian Ministry of University and Research, by INFN, and by a contribution from the Lazio Region aimed at the realization of an industrial applications beamline named ARIA.

The TDR is the result of an extensive collective effort: 176 signatories from 28 institutes contributed to the definition of the project, demonstrating the strength of a highly integrated national and international scientific network. Alongside the Accelerator and Technical Divisions of LNF, which played a central role in the machine and infrastructure design, fundamental contributions were provided by CNR, Elettra Sincrotrone Trieste, ENEA, Sapienza University of Rome, the University of Milan, and the University of Rome Tor Vergata.
EuPRAXIA@SPARC_LAB, shown below, represents one of the two European pillars of the EuPRAXIA project, included in the ESFRI roadmap, and provides a concrete demonstration of the possibility of building more compact, energy-efficient, and scalable accelerators. The adopted acceleration configuration, combining X-band RF technology with high-gradient PWFA, marks a turning point in the evolution of compact radiation sources, particularly for Free Electron Laser facilities, but also for those based on Compton scattering and betatron radiation.

The international Project Review Committee, which has followed the project since 2021, expressed a fully positive assessment in its final report, recognizing the technical robustness, engineering maturity, and feasibility of the initiative.

"LNF has always been committed to the development of new accelerator technologies," emphasizes Director Paola Gianotti. "Following in the footsteps of Bruno Touschek, who led the construction of the first matter–antimatter collider, we once again find ourselves at the forefront in guiding the community toward a new technological leap."

"With the publication of the TDR, we enter the implementation phase of an infrastructure that is not merely a technological project, but a strategic platform for the future of advanced accelerators in Europe. This achievement stems from an extraordinary team effort, fully consistent with the long and distinguished history of LNF and reaffirms Frascati as an international center of excellence in Particle Accelerator Physics," declares Massimo Ferrario, coordinator of the EuPRAXIA@SPARC_LAB project.

The Technical Design Report is freely available at the following link.

EuPRAXIA puts Sustainability at the Heart of Innovation

EuPRAXIA has placed itself at the forefront of efforts to make major scientific facilities, advanced technologies and research careers more sustainable. The Innovations for a Sustainable Tomorrow symposium, held at The Spine on 10 July 2026, brought together leading scientists, policy experts, technology companies and early-career researchers to consider how sustainability should shape the next generation of research.
The event discussed the complete innovation chain, from the design and operation of advanced research infrastructures to artificial intelligence, medical technology, industrial partnerships and the training of future scientific leaders. It covered applications ranging from fundamental research, to medicine, electronics, energy and the environment.

Prof Massimo Ferrario during his presentation at the Symposium.

Professor Welsch, Head of Accelerator Science at Liverpool, said: “Sustainability must become a design principle for science, not an afterthought. In Liverpool, we are connecting novel acceleration techniques, artificial intelligence and advanced instrumentation to reduce energy and resource demands while increasing scientific and societal impact. We have a key role in defining this agenda with our international partners, and we are also training the experts who will deliver it.”

The symposium featured senior speakers from some of Europe’s leading scientific organizations. This included Professor Massimo Ferrario of INFN who delivered a keynote presentation on plasma-accelerator technology and the EuPRAXIA vision. In his talk he explained how radically more compact accelerator facilities could open new scientific and technological opportunities.

Aleš Hála, Head of ELI ERIC’s Innovation Office, discussed next-generation skills development, while Professor Richard Harding (STFC) examined partnerships between academia, industry and the public sector in the rapidly developing quantum-technology landscape.

The program placed Liverpool’s regional innovation ecosystem in an international context. John Whaling of the Liverpool City Region Combined Authority discussed the conditions needed to create a successful innovation ecosystem, which was followed by Dr Denise Völker (DESY), who focused on sustainable technologies for next-generation accelerators.

The program ended with an engaging panel discussion chaired by Prof Welsch about the future of sustainable technology. It featured Dr Lidia Borrell-Damián (Secretary General for Science Europe), Dr Massimo Noro (Director for Business Development for STFC) and, once again, Dr Völker of DESY.

Contributions from industry experts Dr James Cocks (Mirion Technologies), Dr Steve Wells (Adaptix) and Dr Sruthy Viswan (Amplitude) showed how cross-sector R&D can lead to practical technologies, including advanced radiation detectors, low-dose mobile 3D X-ray imaging and more sustainable lasers.

Panel discussion at the symposium.

Prof Carsten P. Welsch talking to the participants at the Innovations for a Sustainable Tomorrow Symposium.

Liverpool researchers presented complementary case studies on intelligent sensors for accelerator operation, deep learning and real-time event reconstruction, and machine-learning-based beam-profile reconstruction. Together, these examples showed how smarter data use can improve experiment performance while reducing unnecessary computation, experimental time and resource consumption.

EuPRAXIA-DN Fellow Ana Maria Guisao Betancur presenting a case study on innovative sensor technologies.

A central message from the event was that sustainability cannot be achieved by one discipline or organization working in isolation. By bringing different research communities together in Liverpool, the symposium created a forum in which sustainability could be considered from the outset.

An industry exhibition and poster session extended this discussion beyond the formal presentations, giving researchers, businesses and prospective partners opportunities to identify new projects and routes to application.

The scientific and training model showcased in Liverpool is fully aligned with the direction of government and international policy. The UK's ten-year Industrial Strategy emphasizes research and development, technology adoption, business investment and the creation of highly skilled employment, i.e. exactly those areas that were addressed by the symposium.

At European level, improved researcher careers, infrastructures, international cooperation and technologies supporting the green and digital transitions are all strongly supported.

The symposium was made possible through the close relationship between Liverpool's LIV.INNO Centre for Doctoral Training the EuPRAXIA Preparatory Phase Project and the EuPRAXIA Doctoral Network. It brought research laboratories, universities, government bodies and businesses behind a shared sustainability agenda that will now shape future R&D.

All presentations can be accessed via the event website.

Advanced skills training for LIV.INNO and EuPRAXIA-DN students

EuPRAXIA-DN Fellows joined forces with third and fourth-year LIV.INNO students from the University of Liverpool for four days of training designed to equip them with essential career skills.

Group photograph of the students taking part in the training.

The program followed a successful format previously delivered as part of the LIV.DAT CDT and other European-funded doctoral networks.

Following an introduction by EuPRAXIA-DN coordinator and LIV.INNO director Carsten Welsch, students spent the first day learning advanced project management skills with Fraser Robertson and Rosie Doyle from Fistral. This session built upon the introductory course undertaken in their first year, focusing heavily on the competencies required to collaborate effectively within large-scale projects across both industry and academia.

On the second day, Carsten Welsch hosted a seminar on writing grant applications. This was followed by a session from UKRI's Corinna Kilpatrick and Megan Franks on CV writing, which highlighted the key differences between academic and industry resumes. To conclude the day, the University of Liverpool Careers team delivered a presentation on interview techniques and optimized LinkedIn strategies.

The third training day was tailored exclusively for EuPRAXIA-DN students, building on the diagnostics and outreach training they received the prior week. Led by Diana Powell of UK Unplugged, the session focused on family and child outreach, with a specific emphasis on the SEND community. The "AI and Eyes" outreach box, developed during the LIV.INNO project, served as a prime example of an engaging, family-friendly activity. The final day featured a dedicated careers workshop, where six speakers from diverse organizations employing physics PhD graduates shared insights into their roles. They discussed their career trajectories and the specific skill sets required for their positions. Academia was represented by Alberto Acuto (University of Liverpool), followed by industry insights from Sai Dintakurti (Quantum Science) and freelance science communicator Lucas Kreuzer. Representatives from Rapiscan and the NHS also contributed before the day concluded with a talk from the British Board of Agrément.

By the end of the four-day program, the students walked away with valuable new skills poised to benefit them immensely in their future professional lives.

EuPRAXIA-DN Fellows take on hands-on training challenges

EuPRAXIA-DN Fellows came together at the Cockcroft Institute from 29 June to 3 July 2026 for a week of hands-on challenge-based training delivered by the University of Liverpool QUASAR Group and supported by D-Beam Ltd.

The 12 Fellows were split into three teams and challenged to apply their scientific, technical and communication skills across a series of practical activities. The programme was designed to complement the Fellows' research training by giving them experience of working outside their immediate areas of expertise.

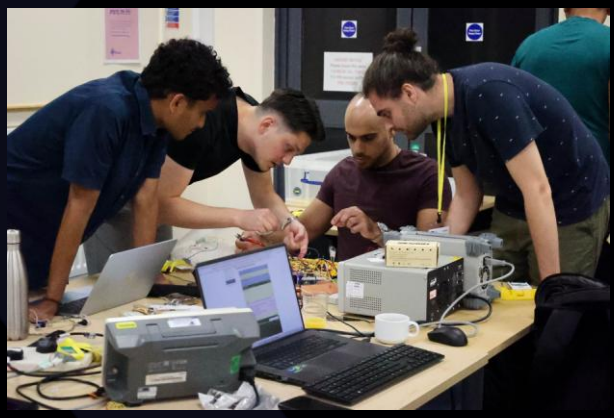
Group photograph of the students taking part in the training.

The week featured three experimental challenges, with each team tasked with developing a different scientific demonstrator. The projects covered Schlieren imaging, radio-frequency measurements of the quality factor, or Q factor, of biscuit tins, and the construction of a ball-bearing accelerator.

The Schlieren imaging challenge saw Fellows develop an optical system capable of visualising small changes in the refractive index of air. The Beam Busters team combined this with a purpose-built wind tunnel, providing an opportunity to investigate the flow around different objects and explore techniques commonly used to visualise otherwise invisible physical phenomena.

The Beam Sense team explored the principles of radio-frequency resonators through measurements of everyday biscuit tins. By investigating their resonant behaviour and Q factor, the challenge provided an accessible route into concepts that are directly relevant to RF systems and accelerating structures.

The third experimental challenge focused on a ball-bearing accelerator, giving the team GoPanthers! the opportunity to combine fundamental accelerator physics with practical problem solving and experimental optimisation.



Fellows working on the experimental challenges.

Alongside the experimental work, the teams were given a reinforcement-learning challenge in which they competed to develop the best-performing agent for an accelerator optimisation task. This introduced the Fellows to a rapidly developing area of accelerator research, where artificial intelligence and machine-learning techniques are increasingly being investigated for applications ranging from machine tuning to autonomous control.

Communication and outreach were also an important part of the programme. The Fellows were challenged to turn their technical work into engaging demonstrations and short videos, requiring them to think not only about whether their experiments worked, but also about how they could explain the underlying science to a wider audience.

Fellows demonstrating their projects to the visiting A-level students.

The teams were able to put these skills into practice with visiting A-level students. This gave the Fellows direct experience of adapting complex scientific ideas for non-specialists while encouraging the students to engage with accelerator science and the technologies associated with it.

A competitive element ran throughout the week, with the teams collecting points from the different challenges and activities. With the final scores combining performance across the programme, the competition remained extremely close until the end. Only five points separated the teams in the final standings, with Go Panthers! emerging as the overall winners of the challenge week.

By bringing together experimental physics, accelerator science, artificial intelligence and science communication, the week provided the EuPRAXIA-DN Fellows with an opportunity to develop a broad range of transferable skills while working collaboratively with colleagues from across the network.

Watch the videos:

Making the Invisible Visible: Schlieren Imaging System Setup | Beam Busters

https://youtu.be/gU09Tz0pCUw

RF accelerating cavity: a DIY science project | Beam Sense

https://youtu.be/SK3fVdxtG94

We built a particle accelerator on a tabletop! | GoPanthers!

https://youtu.be/KBQtALWgoTM

EuPRAXIA-DN Steering Committee Meeting Highlights Strong Scientific Progress and Future Planning

The EuPRAXIA Doctoral Network (EuPRAXIA-DN) Steering Committee met on 24 March 2026 in a hybrid session hosted from IST Lisbon to review recent progress and prepare for the final phase of the project.

Discussions highlighted the strong scientific momentum across the network, with many Fellows reaching key milestones in their research. A growing number of journal publications are emerging, with several papers already published or under review and more expected in the coming months. At the same time, experimental campaigns at leading international facilities are generating high-quality datasets that will underpin future publications and doctoral theses.

The increasing visibility of the network was also evident, with Fellows presenting their work at major conferences and contributing invited talks within the global accelerator community.

The Steering Committee found that Fellows are progressing well with their deliverables and secondments, while also engaging in outreach activities that communicate their research to wider audiences.

Looking ahead, 2026 will be a pivotal year for the network, with a series of major events planned to bring together researchers, industry, and stakeholders. These include a EuPRAXIA showcase in Brussels on 23 April, hands-on training and advanced skills schools in Liverpool, a large international symposium, and the final EuPRAXIA-DN conference on the island of Elba in September 2026.

As the project moves towards its final phase, the consortium is focusing on delivering its strong scientific outputs while also exploring future opportunities, including plans for a potential new doctoral network. Together, these efforts underline the continued success of EuPRAXIA-DN in training the next generation of researchers and advancing cutting-edge accelerator technologies.

>>> Fellows News

Radiotherapy of the Future: David Gregocki presents key results at CNR Workshop in Pisa

Fellow David Gregocki presented recent research activities at the Workshop on Advanced Radiotherapies and Diagnostics in Oncology, held between the 12th and 13th of March at the CNR Research Area in Pisa. The event gathered national and international experts to discuss emerging technologies and future directions in radiotherapy and oncological diagnostics.

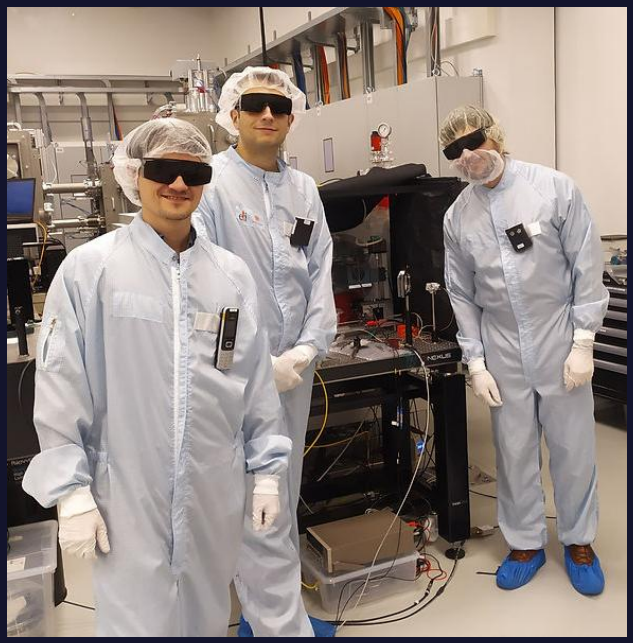
David's contribution focused on the recent outcomes of experimental activities carried out at ILIL, CNR-INO, with particular emphasis on real-time dose monitoring of laser-driven electrons for medical applications. The work presented is closely related to ongoing efforts in the field of innovative radiation delivery techniques, including approaches based on Ultra High Dose Rate (UHDR) irradiation and the investigation of the FLASH effect, which have attracted increasing interest due to their potential to improve the treatment of radioresistant tumors while reducing damage to healthy tissues. These technologies may also contribute to shorter treatment times and improved healthcare systems' sustainability.

The workshop marked the conclusion of the PNRR-funded activities of the Spoke 1 project, while also serving as a platform for identifying new research directions. By fostering dialogue between researchers, clinicians, and international partners, the event aimed to strengthen the connection between advanced research and clinical practice and to promote future collaborations beyond the framework of the Italian PNRR program.

Measurements successfully completed at ELI ERIC

Fellow David Gregocki participated in a one-week experimental campaign between the 9th and 13th of March at ELI-ERIC in Prague, Czech Republic. The activities focused on the characterization of laser-driven electron beams, with particular attention to the measurement of beam charge and delivered dose at high laser repetition rates (1 kHz). The experimental work involved the use of integrated current transformers together with novel charge and dose measurement devices aimed at improving the reliability and precision of diagnostics for high-repetition-rate laser-plasma accelerators. These measurements are essential for assessing beam stability and reproducibility, which are key requirements for the future implementation of laser-driven sources in scientific and medical applications.

The campaign was carried out as part of an active collaboration between researchers from ILIL, CNR-INO, and the ALFA research group at ELI ERIC. Collaborative experimental efforts of this kind play an important role in advancing the development of laser-plasma accelerator technologies, fostering the exchange of expertise, and enabling the testing of innovative diagnostic solutions in large-scale research infrastructures.



Group photo at the ALFA experiment at ELI-ERIC in Prague, Czech Republic. From the left: Dr. Illia Zymak (ELI-ERIC), Dr. Carlo Maria Lazzarini (ELI-ERIC), and Ing. David Gregocki (ILIL, CNR-INO). Photo taken by Dr. Luca Weninger.

Reflections from EuPRAXIA Fellow Ana's Secondment at SPARC

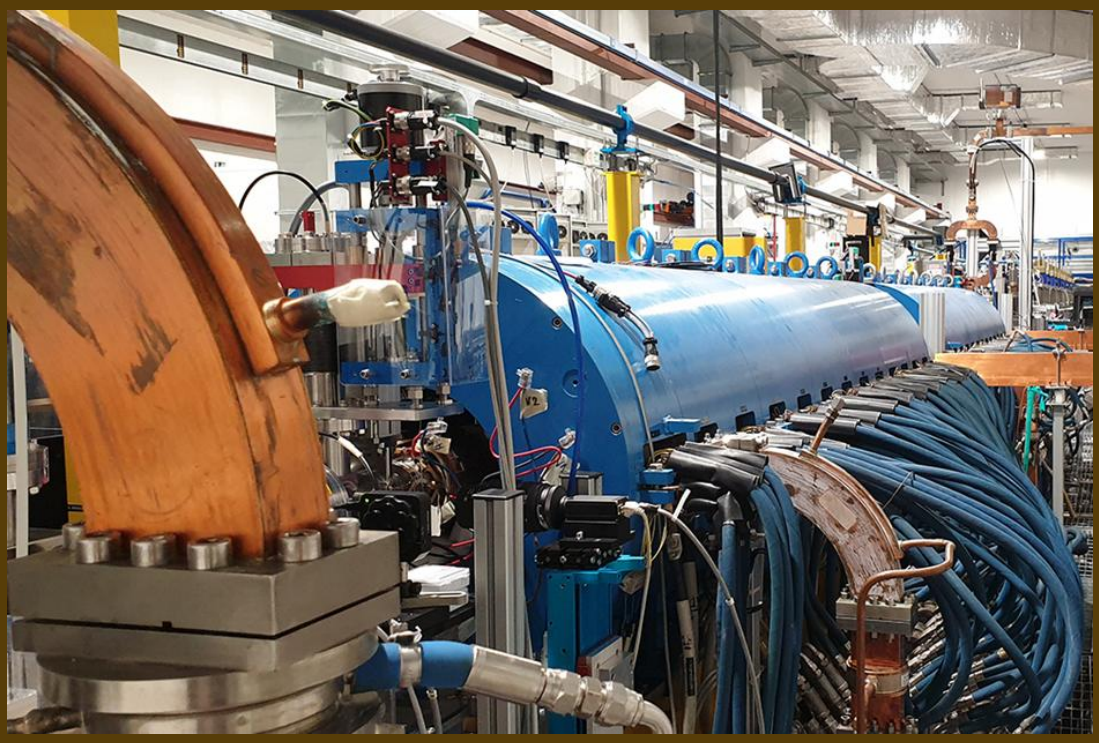
EuPRAXIA DN Fellow Ana Guisao Betancur recently took part in a four-week secondment at SPARC. During her time there, she focussed on data acquisition with their RF deflector for full bunch characterisation and in data analysis for a THz-based longitudinal diagnostics currently under development. Additionally, she had the opportunity to study and discuss the facility's beam-driven accelerator concepts and future plans with different members of the team.

EuPRAXIA partner SPARC_LAB (Sources for Plasma Accelerators and Radiation Compton with Laser And Beam), is located at INFN Frascati National Laboratory (INFN-LNF) and is made up of a conventional high brightness RF photo-injector and a multi-hundred terawatt laser. Ana's experience at SPARC working alongside Dr Livio Verra afforded her valuable insights into the operation and experiments carried out at the facility.

Ana is currently based at the Cockcroft Institute in the UK where she is working on ultrashort bunch length measurements with femtosecond resolution.

Looking back on her secondment, she highlighted it as a valuable experience to get to know more about this EuPRAXIA site and to connect with other researchers working in a wider range of topics in plasma accelerators.

Ana added that "the secondment was valuable and productive. It offered access to facilities that are currently not available at my institution through the operation of the accelerator and data acquisition from the control room, and it was fulfilling having the opportunity to use what I have learned in my own research to participate in discussions about their diagnostics."



SPARC_LAB at INFN-LNF (Credit: EuPRAXIA/ A.Welsch)

>>> Partner Updates

EuPRAXIA expert contributes to high-level European debate on the future of doctoral training

Professor Carsten P Welsch, EuPRAXIA-DN coordinator and EuPRAXIA-PP WP2 leader, joined senior European research leaders in Brussels last week for a high-level discussion on the future of doctoral education and the added value of Marie Skłodowska-Curie Actions Doctoral Networks.

The event, More Than a PhD: The Added Value of MSCA Doctorates, was hosted by the European Research Executive Agency on 24 - 25 June and brought together policy makers, university leaders, doctoral education specialists and MSCA experts to examine how doctoral training can best prepare researchers for successful careers across academia, industry and wider society.

Professor Welsch was invited to contribute to the panel discussion on The State of Doctoral Training in Europe, chaired by Klaus Haupt, Head of Unit for MSCA Doctoral Networks at the European Research Executive Agency (REA). The panel brought together senior voices from the European Commission, the European University Association, REA, research leaders and program managers from across Europe, reflecting the strategic importance of doctoral education to Europe's research and innovation landscape.

Professor Welsch's contribution was based on his exceptional track record in designing and leading international postgraduate research training programs. As Director of two STFC Centres for Doctoral Training in Data Intensive Science, Coordinator of six pan-European doctoral networks and past Chair of STFC's Education Training and Careers Committee, he has played a leading role in shaping how early-career researchers are trained for complex, interdisciplinary and international research environments.

His programs have trained more than 100 Marie Curie Fellows and helped establish models of doctoral education that combine scientific excellence with international mobility, cross-sector exposure, transferable skills, public engagement and strong cohort identity.

The Brussels event also marked the launch of a new European Research Executive Agency report, The Added Value of MSCA Doctorates: A Mixed-Methods Study. The study provides the first large-scale systematic comparison of MSCA Doctoral Networks with other doctoral programs and surveyed around 6,800 doctoral candidates and supervisors worldwide.

Its findings strongly support the value of the MSCA model. More than nine in ten surveyed participants agreed that MSCA Doctoral Networks provide added value compared with other doctoral programs. The report also found that MSCA researchers achieve strong career outcomes, with a high share employed within one year of completing their doctorate and significantly greater likelihood of securing roles in business or other non-academic sectors compared with non-MSCA peers.

The report highlights the features that make MSCA Doctoral Networks distinctive, including international collaboration, intersectoral experience, interdisciplinary mobility, team-based supervision and better support structures. Seven in ten MSCA PhD researchers reported interdisciplinary mobility, while eight in ten MSCA supervisors said their research project would not have been possible without MSCA doctoral funding.

These findings closely align with Professor Welsch's long-standing approach to postgraduate research training. He has championed doctoral education that goes beyond a traditional apprenticeship model, preparing researchers to operate confidently across disciplines, sectors and borders. His work has helped demonstrate that world-leading research training must combine deep technical expertise with collaboration, adaptability, communication and leadership.

Following the event, Klaus Haupt thanked Professor Welsch and fellow panelists for their contributions, highlighting: "Your insights and your expertise enriched the discussions and provided invaluable food for thought for all attendees." He added that the panel's contributions "underscored the importance of the MSCA programme in shaping the next generation of doctoral training in Europe" and would "inspire further dialogue and action."

To access the full report, please visit this site.

EuPRAXIA at IPAC'26 in Deauville

EuPRAXIA has recently been presented at the International Particle Accelerator Conference (IPAC'26) in Deauville, France. The 2026 edition was hosted by the GANIL laboratory in collaboration with CEA, CNRS, Synchrotron SOLEIL, and ESRF.

The event attracted over 1,500 delegates from 41 countries and included a large industry showcase with over 100 exhibitors.

The comprehensive scientific programme highlighted global advances in accelerator research and development, offered insights into emerging projects, and enabled participants to exchange views on the latest progress in accelerator facilities worldwide. Alongside the engaging programme, attendees also had the opportunity to network with peers and build new professional connections.

Several members of the large EuPRAXIA community attended the conference, contributing to the scientific programme through talks or poster presentations.

Alexander Molodozhentsev (ELI Extreme Light Infrastructure) gave a talk on the designation of ELI ERIC as the second pillar of the EuPRAXIA distributed user facility and its development of a user-focused programme centred on laser–plasma accelerators.

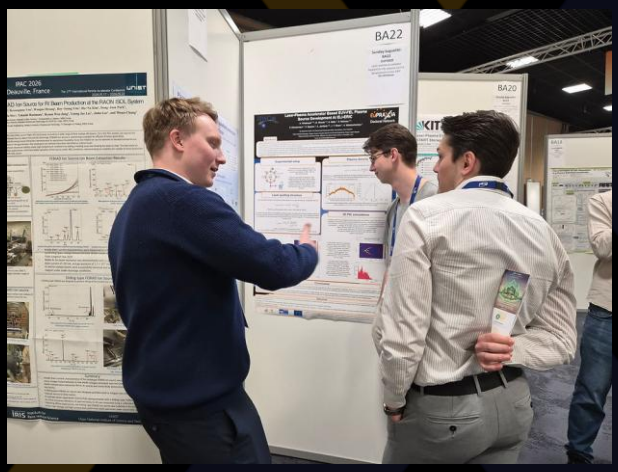
Another notable contribution was a presentation by Brigitte Cros (CNRS) on how electron beams with high quality, and tunable electron energy, have been achieved using the DRACO facility (HZDR Dresden), showing that the injection and acceleration processes can be controlled consistently in a gas cell.
The scientific programme also featured a poster on the status of the EuPRAXIA Doctoral Network, presented by EuPRAXIA-DN coordinator Carsten P Welsch (INFN/University of Liverpool). This highlighted selected research results and showed how training, secondments, schools and camps all are integral part of the network.

Alongside Professor Welsch, six of the network's Fellows also presented posters at the conference, showcasing their latest research and developments.

Mihail Miceski, based at the Extreme Light Infrastructure ERIC, presented a poster on the impact of injection errors on EUV FEL performance in an active plasma lens (APL)-based beamline. The work investigated how position and angle mismatches at the injection point affect beam transport, emittance preservation, charge transmission, and FEL saturation. Using particle-tracking and FEL simulations, the study identified acceptable ranges of injection errors and highlighted the advantages of APLs as capture systems for maintaining optimal FEL performance. The results contribute to the development of compact free-electron laser facilities at ELI ERIC and within the EuPRAXIA project.

Alexander Molodozhentsev during his talk at IPAC'26.

Andrés Leiva Genre, based at Pécs, Hungary, shared results on multi-cycle THz pulse generation and THz-driven electron acceleration. According to simulation results, acceleration gradients of approximately 120 MeV/m can be reached with current technology. Moreover, higher acceleration gradients can be expected as high-intensity THz sources further develop.



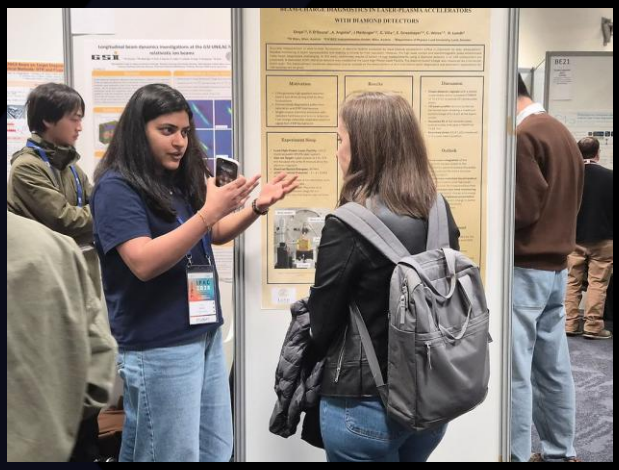
Alex Whitehead and Mihail Miceski during the poster session.

Alex Whitehead, based at the Extreme Light Infrastructure ERIC, presented a poster on Laser-Plasma Accelerator Based EUV-FEL Plasma Source Development At ELI-ERIC. In this poster, we analysed a plasma-target concept designed to generate stable, high-quality electron beams essential for compact Extreme Ultraviolet (EUV) FEL applications. This work is contributing for the 100 Hz LPA-based FEL, under development at ELI ERIC in the frame of the EuPRAXIA project.

Xianghe Fang, based at INFN, Italy, presented the latest update on the RF stabilization technique at SPARC_LAB of INFN-LNF, which is also recently accepted as a research article in the journal Applied Sciences. The results demonstrate a cheerful progress on phase jitter control in the klystron feeded RF system. The achieved 15-fs synchronization enables a promising and stable operation in beam-driven plasma wakefield accelerations.

Ana Maria Guisao Betancur, based at the University of Liverpool/Cockcroft Institute, UK, shared latest results of her studies into coherent transition radiation for bunch length diagnostics.

Divya based at CIVIDEC, presented how diamond detectors can be used for beam charge measurements in laser-plasma accelerators.



Divya explaining her research to a delegate.

The EuPRAXIA communication and public relations team from the University of Liverpool hosted a booth to promote the portfolio of EuPRAXIA projects as part of the industry exhibition. The booth featured information from the Preparatory Phase project, PACRI and the EuPRAXIA Doctoral Network. It was shared with the LIV.INNO Centre for Doctoral Training, with which the doctoral network has jointly organised a number of training events. It attracted many visitors and acted as a key location for networking and information sharing.

A highlight of the booth was the release of the second edition of the comprehensive EuPRAXIA-DN brochure featuring the project's recent R&D, showcasing the research of the Fellows, and providing information about the network partners.

The booth showcasing EuPRAXIA at the industry exhibition.

The brochure is now available for download on the EuPRAXIA-DN website and will be distributed at prominent scientific conferences and workshops. It aims to raise awareness within the broader scientific community about the research being conducted by the EuPRAXIA-DN Fellows.

EuPRAXIA Gains Momentum at High-Level Brussels Event

Stakeholders from research, industry, and funding agencies gathered in Brussels for the EuPRAXIA Showcase Meeting.

Leading representatives from European institutions - from the European Commission to the European Strategy Forum on Research Infrastructures (ESFRI) - together with stakeholders from research, industry, and funding agencies gathered on 23 April in Brussels, at the Foundation University, for the EuPRAXIA Showcase Event 2026. This high-level meeting aimed to strengthen collaboration, promote innovation in accelerator technologies, and discuss new funding opportunities for one of Europe's most ambitious research infrastructure projects.

"EuPRAXIA's vision is to bring together the best know how available in European laboratories and universities, to collaborate and foster innovation and competitiveness around a research infrastructure dedicated to novel acceleration technologies, while activating all possible synergies," said Pierluigi Campana, Coordinator of the EuPRAXIA Preparatory Phase project.

The Showcase highlighted EuPRAXIA's vision to deliver a next-generation, compact plasma-based accelerator facility, capable of transforming applications across science, medicine, and industry. As outlined during the opening session, EuPRAXIA is building a pan-European, distributed research infrastructure that integrates cutting-edge plasma acceleration technologies with a strong user-driven approach.

The project, included in the ESFRI Roadmap, is designed to fill a critical gap in Europe's research infrastructure landscape, while fostering collaboration among over 38 laboratories and hundreds of researchers across Europe and beyond.

A central focus of the event was dialogue with policymakers and funding agencies. High-level speakers from the European Commission and the Research Executive Agency participated in dedicated panel discussions addressing opportunities for research infrastructures under future Horizon Europe programs, as well as strategies for innovation, technology transfer, and industrial uptake.

These discussions underlined the importance of coordinated European investment and long-term funding strategies to ensure the successful implementation of large-scale infrastructures such as EuPRAXIA .

Industry leaders from companies such as ScandiNova, Kyma, and Instrumentation Technologies contributed perspectives on market opportunities and the growing demand for advanced accelerator technologies, which already underpin a global market valued at nearly $10 billion.

A key theme throughout the meeting was the exploitation of synergies across Horizon Europe programs, enabling EuPRAXIA to integrate research, training, and innovation activities across multiple projects and funding streams.

To date, the EuPRAXIA ecosystem has successfully mobilized around €150 million in funding and in-kind contributions, combining European, national, and regional investments. This diversified funding model is seen as essential for the long-term sustainability of the infrastructure.

Speakers emphasized that aligning initiatives such as the Preparatory Phase, MSCA Doctoral Network, and technology R&D projects, such as the 10 M€ PACRI project, creates a coherent innovation pipeline, accelerating the transition from fundamental research to real-world applications.

EuPRAXIA aims to harness plasma acceleration technologies capable of delivering particle energies up to 1,000 times higher than conventional methods over much shorter distances, opening the door to more compact, efficient, and cost-effective accelerators.

Such advances have the potential to revolutionize medical imaging and cancer therapy, materials science and industrial inspection, as well as environmental monitoring and energy applications.

With more than 30,000 accelerators already in use worldwide, primarily in industry and healthcare, the societal and economic impact of next-generation technologies is substantial.

Professor Carsten P Welsch, Coordinator of the EuPRAXIA Doctoral Network and one of the event organizers, said: “The next phase of EuPRAXIA will require a careful blending of funding sources, including European programs, national contributions, regional support, and industrial partnerships, alongside continued strong collaboration within the consortium. EuPRAXIA is very well positioned to achieve its ambitious goals.”

The presence of high-level representatives from the European Commission, ESFRI, national ministries, and leading research organizations sent the clear message that EuPRAXIA is emerging as a flagship European initiative in advanced accelerator technologies.

By bringing together science, industry, and policy, the EuPRAXIA Showcase Meeting 2026 demonstrated the project’s growing momentum and its strategic importance for Europe’s competitiveness, innovation capacity, and scientific leadership.



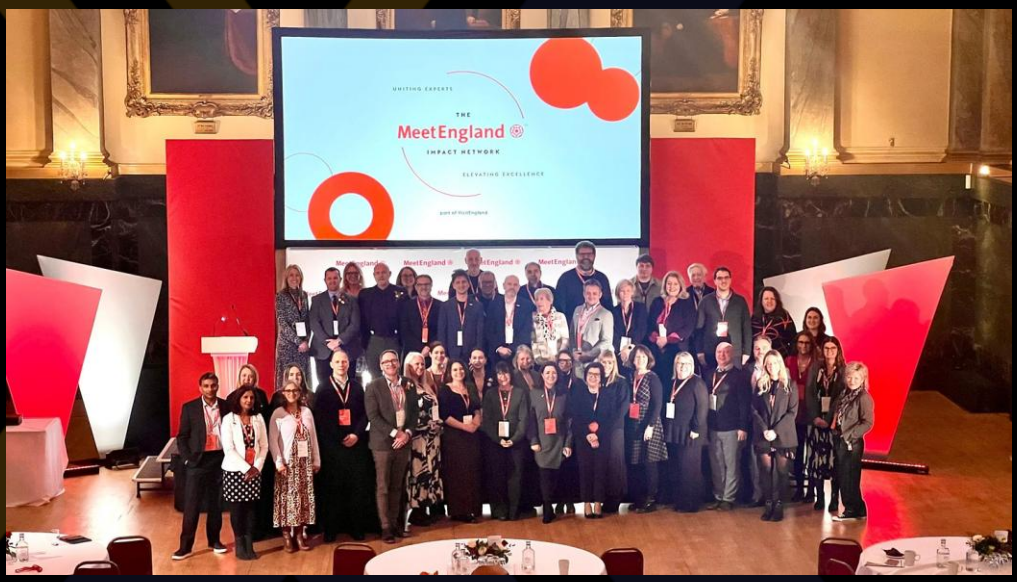









Professor Welsch recognized on the MeetEngland 2025 Roll of Honour



Participants at the MeetEngland launch event. (credit: MeetEngland)

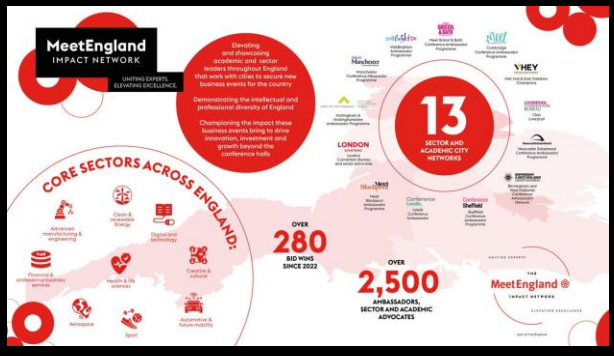
Prof Carsten P Welsch, EuPRAXIA-DN coordinator and EuPRAXIA-PP WP2 leader, was presented with a 2026 MeetEngland Impact Network Award in recognition of his outstanding achievements in bringing major scientific events to England.

In addition to dozens of scientific workshops, schools and symposia, Professor Welsch had a key role in bringing the flagship Linear Accelerator Conference (LINAC 2022), the International Beam Instrumentation Conference (IBIC 2025), and the International Particle Accelerator Conference (IPAC'29), the world's largest event in this scientific area, to Liverpool.

The event took place at Cutler's Hall in Sheffield on 12 February 2026, bringing together convention bureaus, conference ambassadors, and academics.

Professor Welsch has been an ambassador for Club Liverpool since the programme's launch ten years ago, supporting efforts to attract business events to the region and contributing millions of pounds to the local economy.

The MeetEngland event, held to officially launch the new national Impact Network, featured insightful success stories by academic and sector leaders which highlighted collaboration, innovation, and impact in international business events. It also included the presentation of the MeetEngland 2025 Roll of Honour, and panel discussions about collaboration in action and how conferences can effectively catalyse business activity.



MeetEngland infografic.

The MeetEngland Impact Network brings together ambassadors, advocates, academic leaders, and sector specialists from across England, combining their individual contributions into a strong and visible national movement. By acting as a single strategic umbrella, it aims to strengthen the work of city ambassador programmes and city partnership networks, helping them connect with important academic and industry communities in their areas.

>>> Selected Publications

Meter-Scale Discharge Capillaries for Plasma-Based Accelerators

L. Crincoli, R. Demitra, V. Lollo, D. Pellegrini, M. Ferrario, and A. Biagioni

APPLIED SCIENCES 16, 3291 (MAR 28 2026)

https://doi.org/10.3390/app16073291

Gas-filled discharge capillaries are widely used in the field of plasma-based particle accelerators, due to their compactness, cost-effectiveness and versatility for different applications. Technological improvement of such Plasma sources is necessary to enable high energy gain acceleration at the meter scale, as required for next generation particle colliders and light sources. Beam quality preservation within such an acceleration length involves accurate tuning of the plasma properties. In particular, precise tailoring of the plasma density distribution is required to control the emittance growth of particle bunches during the acceleration process. In this context, this paper presents a scalable and versatile approach for the design of meter-scale discharge capillaries, aimed at achieving fine tuning of the plasma density distribution, with the possibility of locally controlling the density profile by acting on the source geometry. Forty-centimeter-long capillaries are designed using numerical fluid dynamics simulations and tested in a dedicated plasma module. Different arrangements of the gas inlets are tested, with their number and diameter varied, to assess the effect of the capillary geometry on the plasma properties. Plasma density measurements show that a higher number of inlets with variable diameter along the plasma formation channel provides an enhancement in the homogeneity of the electron plasma density distribution. Longitudinal density plateaus are observed along most of the plasma channel length, with a center-to-end density uniformity of up to 80%. The experimental results highlight the proposed approach's capability to modulate the longitudinal plasma density distribution by acting on the capillary geometry, thus providing uniform density profiles over the meter scale, as required for plasma-based acceleration experiments

A structured plasma profile for an optimized laser-driven accelerator of quality enhanced very high energy electrons (VHEE)

F. Avella, P. Tomassini, L. Labate, and L. A. Gizzi

PHYSICS OF PLASMAS 33(4), 043101 (APR 1 2026)

https://doi.org/10.1063/5.0315070

We present a numerical study on a structured plasma target to simultaneously improve the energy spread and divergence of a laser-driven very high energy electron (VHEE) beam designed for VHEE-radiotherapy (RT) application. The main concept to obtain such an enhanced quality beam is to localize the injection, acceleration, and extraction of the electrons by tailoring the plasma target density profile. The injection space is truncated by spatially confining the ionization-injection dopant, while the rest of the target is filled with He atoms. In order to reduce the emittance growth during the bunch extraction, an optimized density downramp profile is adopted. By using a 100 TW class Ti:Sa laser system and an ionization-injection scheme in the blow-out regime, a relatively high charge (≥120 pC) beam with mean energy ≥200 MeV, rms energy spread ≤6%, and normalized emittance $\varepsilon_{nx} < 4$ mm mrad can be obtained. This combination of bunch specification enables an efficient transport and focusing of the particles, thus making the beam of particular interest for VHEE-RT.

SPARC_LAB facility for advanced acceleration and radiation experiments

R. Pompili, M. P. Anania, I. Balossino, M. Bellaveglia, A. Biagioni, F. Cardelli, M. Carillo, E. Chiadroni, et al.,

PHYSICAL REVIEW ACCELERATORS AND BEAMS 29, 051602 (MAY 19 2026)

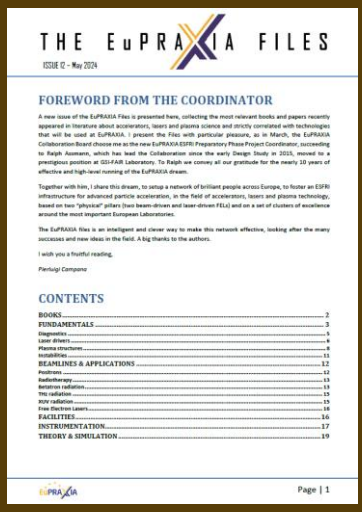
https://doi.org/10.1103/rnz7-3qyj

The SPARC_LAB facility, operating at the LNF-INFN laboratories in Frascati, has been devoted over the past years to R&D related to accelerators, advanced diagnostics, and generation of radiation ranging from THz to extreme UV light. The facility has recently been significantly upgraded and moved toward user-oriented applications, especially after the approval of two additional projects with the goal to develop radiation sources up to the soft x-ray range and in view of the EuPRAXIA project, whose preparatory phase is ongoing with the support of the European Commission. This paper summarizes the electron beam and radiation parameters and describes the layout and main features of the upgraded facility in view of future useroriented experimental activities and applications

The EuPRAXIA Files

The EuPRAXIA Files is a collection of publicly available abstracts of published articles that are relevant to the EuPRAXIA project. Putting together the latest research in plasma accelerators, the aim is to facilitate the work of the many researchers involved in EuPRAXIA and to highlight the scientific outcomes of the various projects supporting the initiative.

The latest EuPRAXIA Files Issue 18 and previous issues can be accessed here: https://www.eupraxia-pp.org/research-resources


THE EuPRAXIA FILES

ISSUE 02 - May 2024

FOREWORD FROM THE COORDINATOR

A new issue of the EuPRAXIA Files is presented here, collecting the most relevant books and papers recently appeared in literature about accelerators, lasers and plasma science and strictly correlated with technologies that will be used at EuPRAXIA. I present the Files with particular pleasure, as in March, the EuPRAXIA Collaboration Board choice me as the new EuPRAXIA-ESFRI Preparatory Phase Project Coordinator, succeeding to Ralph Assmann, which has lead the Collaboration since the early Design Study in 2015, moved to a prestigious position at GSI-FAIR Laboratory. To Ralph we convey all our gratitude for the nearly 10 years of effective and high-level running of the EuPRAXIA dream.

Together with him, I share this dream, to setup a network of brilliant people across Europe, to foster an ESFRI infrastructure for advanced particle acceleration, in the field of accelerators, lasers and plasma technology, based on two "physical" pillars (two beam-driven and laser-driven FELs) and on a set of clusters of excellence around the most important European Laboratories.

The EuPRAXIA files is an intelligent and clever way to make this network effective, looking after the many successes and new ideas in the field. A big thanks to the authors.

I wish you a fruitful reading,

Pierluigi Campana

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EuPRAXIA YouTube Channel

The EuPRAXIA YouTube Channel features a variety of content, including interviews with leading experts such as Ralph Assmann, Founding Coordinator of the EuPRAXIA ESFRI and Preparatory Phase projects, and episodes of the EuPRAXIA Seminar Series.

The EuPRAXIA seminar series will cover the role of simulations and diagnostics in developing plasma accelerators, the principles and applications of free electron lasers, innovative linac technologies, the advantages of beam-driven plasma wakefield acceleration and key applications of plasma accelerators beyond conventional technologies.

The YouTube Channel can be accessed here: https://www.youtube.com/@EuPRAXIA-facility

>>> Job Opportunities

CLPU – Centro de Láseres Pulsados

Postdoc Opportunity - “La Caixa” Junior Leader Fellowships 2027

The Centro de Láseres Pulsados (CLPU) invites outstanding postdoctoral researchers to apply for the “la Caixa” Foundation Junior Leader – Retaining 2027 Fellowship Programme, one of the most prestigious postdoctoral funding schemes in Spain and Portugal.

Successful candidates will join CLPU to develop a research project in a world-class research environment centred on ultra-intense laser science, laser-plasma acceleration, secondary radiation sources, high-field physics and related applications.

Fellowship Highlights

Duration: 3 years
Research fields: STEM (Physics, Engineering, Mathematics, Chemistry and Life Sciences)
Number of fellowships: 20
Research opportunities: Applicants may develop independent projects or build upon CLPU’s ongoing research in laser-plasma acceleration, secondary radiation sources and biomedical applications, with scientific guidance from our researchers.

Funding

The fellowship provides a highly competitive funding package of up to €320,100 over three years, including:

- Up to €64,000/year to cover employment costs (including salary and employer contributions).
- Minimum annual gross salary: €47,000.
- €38,500/year for research expenses, including consumables, equipment, conference participation, travel, personnel, intellectual property and project costs.
- Additional family allowance (€1,200 per dependent child per year).
- Mobility allowance (€5,400) for eligible researchers relocating to the host institution.

Application deadline: 23 September 2026 (14:00 CEST)

More information and how to apply: https://www.clpu.es/lacaixa_fellowship/

>>> Notice Board

EuPRAXIA Doctoral Network

Selection of Events	
30 Aug – 3 Sep 2026	IBIC2026 - 15th International Beam Instrumentation Conference
20-26 September 2026	EuPRAXIA-PP Annual Meeting 2026 and EuPRAXIA-DN Conf, Isola d'Elba
15-18 February 2027	PACRI Annual Meeting

Help us communicate interesting events, updates and latest R&D in plasma accelerator physics and send us your news and updates.

EuPRAXIA-DN
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EuPRAXIA-DN
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This project has received funding from the European Union´s Horizon Europe research and innovation programme under grant agreement no. 101073480 and the UKRI guarantee funds. The information herein reflects only the views of its authors, and the Research Executive Agency is not responsible for any use that may be made of the information contained.