EuPRAXIA Doctoral Network

Welcome!

EuPRAXIA Camp II - Science

Carsten P Welsch

INFN-LNF and U Liverpool/CI

UK Research and Innovation

EuPRAXIA-DN Camp II: Science

14th-15th July, Lisbon, Portugal

TÉCNICO LISBOA
UNIVERSITY OF LIVERPOOL
EuPRAXIA Doctoral Network

Meeting Venue

Anfiteatro Abreu Faro
Instituto Superior Técnico (IST)
Av. Rovisco Pais 1
11049-001 Lisbon
Portugal

Entrance to the site

Overview of Activities

Sunday 13th July, IST (Anfiteatro Abreu Faro)
Welcome Reception from **18:00**

Monday 14th July, IST (Anfiteatro Abreu Faro, Cantinho do Avillez)
Registration from **8:30**
Camp Start **9:00**
Dinner at Cantinho do Avillez **19:00**

Tuesday 15th July, IST (Anfiteatro Abreu Faro)
Camp Start **9:00**
Camp ends **16:20**

Please see Indico for the full agenda.

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.

UK Research and Innovation

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WIFI @ IST

- A temporary guest network will be available, accessible through the tecnico-guest network.
- The account name is EuPRAXIA Camp II
- The password is: A7jZn3

Dinner

Monday 14th July, from 19:00

Cantinho do Avillez

Rua dos Duques de Bragança, 7 1200-162, Lisbon

The restaurant is located here. Please use Google Maps to research appropriate walking/public transportation routes.

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Overview

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A bit of history…

EuPRAXIA Doctoral Network

(Beam Diagnostics, Physics)
4.2 M€, 22 Fellows, 32 partners

(Laser Applications, Engineering)
4.6 M€, 22 Fellows, 38 partners

(Accelerator Optimization, Physics)
6 M€, 23 Fellows, 35 partners

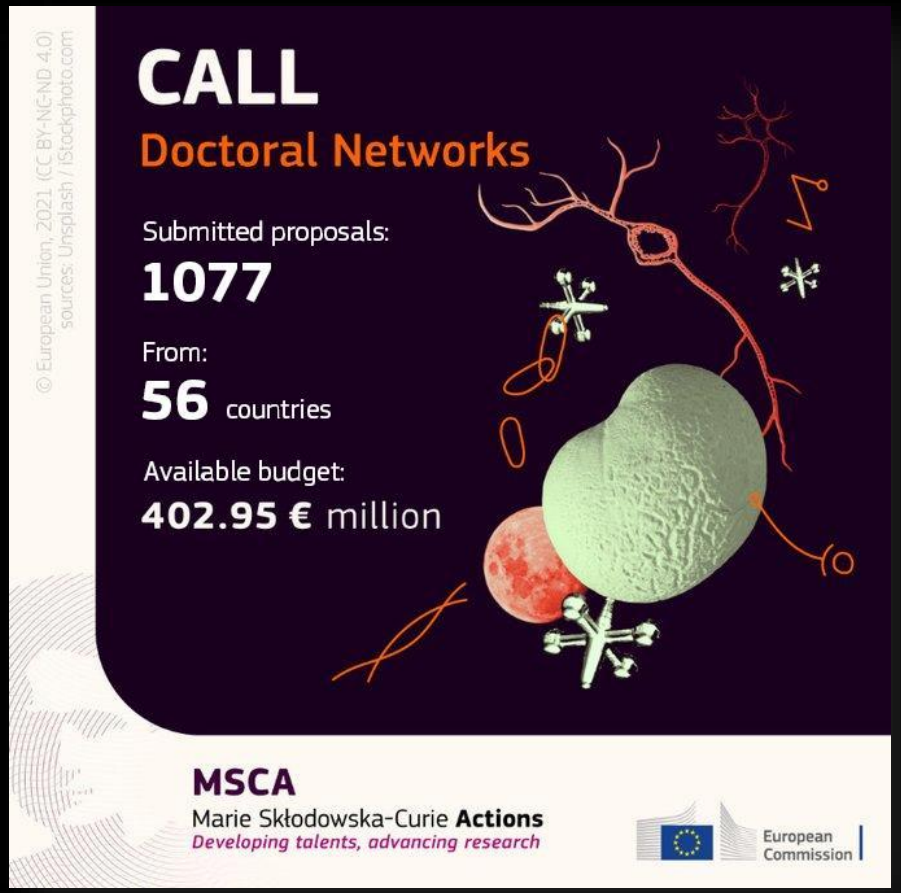
(Medical Applications, Life Sciences)
3.9 M€, 15 Fellows, 31 partners

(Antimatter R&D, Physics)
4.0 M€, 15 Fellows, 24 partners

(Plasma AcceleratorR&D, Physics)
3.2 M€, 12 Fellows, 23 partners

Largest portfolio of MSCA networks in any scientific area; around 25M€ of funding and more than 100 Fellows!
Also: Chair of STFC ETCC, member of UKRI TSAG and Director of two CDTs.

The 2021 MSCA-DN Call



- 897 proposals for standard doctoral networks
- In PHY: 83 proposals – only 10 networks were selected! Success rate was only 12 %.
- Complicated start…but we got there! (Brexit, visa issues,…)
- With 3.2M€ EuPRAXIA-DN is one of the largest networks, training 12 Fellows.

What is EuPRAXIA-DN?

EuPRAXIA Doctoral Network

- 12 high-level Fellowships *(10 Fellows are funded by the EU, another two by the UKRI Guarantee Funds)*;
- Interdisciplinary and cross-sector plasma accelerator research and training program carried out between universities, research centres and industry;
- Organizes a (large) number of international events for the wider community;

Recognized importance of plasma accelerator R&D at European level!

Beneficiaries

EuPRAXIA Doctoral Network

cividec Instrumentation

Consiglio Nazionale delle Ricerche

INFN Istituto Nazionale di Fisica Nucleare

eli

TÉCNICO LISBOA

INSTRUMENTATION TECHNOLOGIES

LUNDS UNIVERSITET

UNIVERSITAS QUINQUEECCLESIENSIS 13 67

UNIVERSITY OF LIVERPOOL

Partner Organizations

EuPRAXIA Doctoral Network

CARBON DIGITAL

ČVUT ČESKÉ VYSOKÉ UČENÍ TECHNICKÉ V PRAZE

D-Beam ltd

eli nuclear physics

Fistral Training and Consultancy Ltd.

FOTON joy of technology

Holdsworth Associates

HYPATIA

האוניברסיטה העברית בירושלים THE HEBREW UNIVERSITY OF JERUSALEM

UKRI Science and Technology Facilities Council

TU WIEN TECHNISCHE UNIVERSITÄT WIEN Vienna | Austria

IN SUPREMÆ DIGNITATIS 1343 UNIVERSITÀ DI PISA

SAPIENZA UNIVERSITÀ DI ROMA

WIGNER

Research

EuPRAXIA Doctoral Network

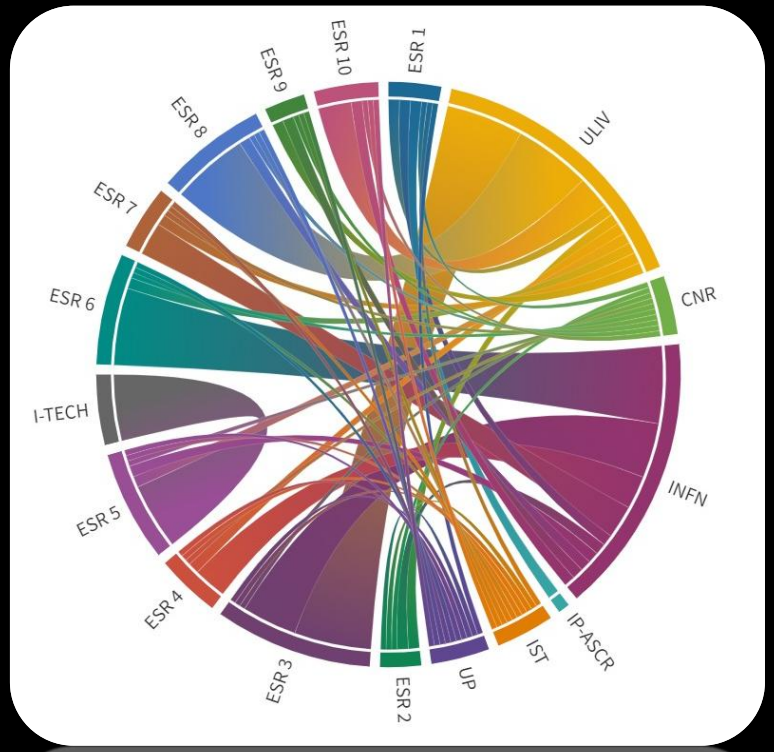
Laser & Plasma

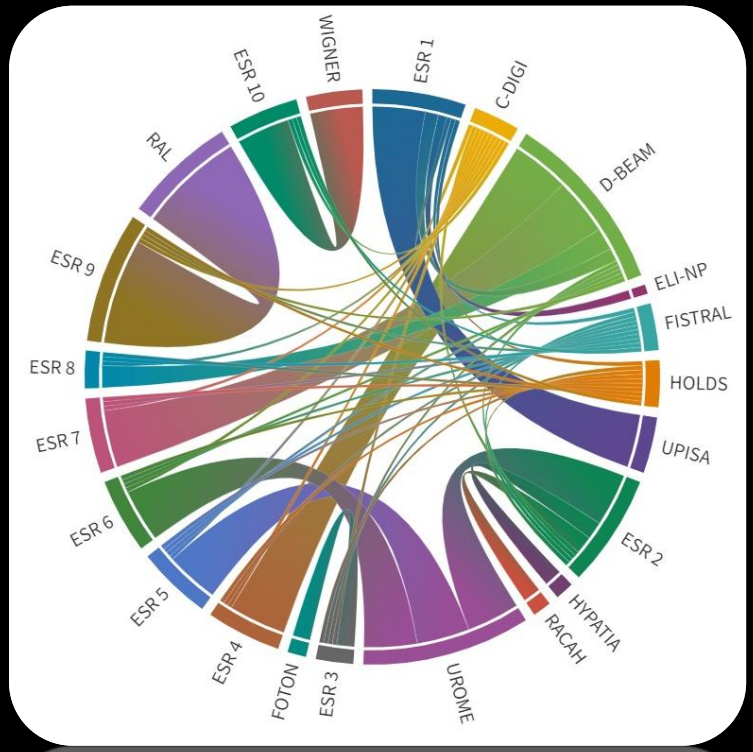
Facility Design & Optimization

Applications

The network's main scientific and technological objectives are split into three closely interlinked work packages.

Secondments





Training & Events

EuPRAXIA Doctoral Network

- International School on plasma accelerators;
- EuPRAXIA Camps on focused research topics – always across the different project work packages.
- Researcher skills trainings designed to prepare all Fellows for their future careers and make them attractive for employers in academia and industry;
- Final conference and outreach symposium to present project results.

Events are open to all Fellows and wider community!

Kick-off Meeting

https://indico.cern.ch/event/1200106/

EuPRAXIA-DN Leaflet

EuPRAXIA Doctoral Network

English | French | Italian | German

EuPRAXIA-DN Brochure

EuPRAXIA Doctoral Network

Prof Carsten P Welsch, EuPRAXIA Camp II – Science. Lisbon, Portugal – 14/15 July 2025

Skills School

- PhD project-specific part
  - Presentation skills
  - Scientific writing
  - Project management
- Generic skills through outreach project
  - Team working
  - Proposal writing
  - Peer review
  - Working under (time) pressure

"I hadn't really thought of myself as a project manager until today!"

Skills School

EuPRAXIA Doctoral Network

Prof Carsten P Welsch, EuPRAXIA Camp II – Science. Lisbon, Portugal – 14/15 July 2025

MSCA Info Day 2023

EuPRAXIA Doctoral Network

Brussels, 8/9 November 2023: **Exemplary exploitation of synergies!**

Media Skills School

- **CONCEPTING, CREATIVE & PLANNING** materials covering production methodologies, ideas, mood-boards, story-telling in the specific area of scientific communication
- **SCRIPTING & STORYBOARDING** of a scientific communications films. Including script, storyboards, animatic, shot list, look development and 2D animation asset creation to be used as film content.
- **POST-PRODUCTION, MOTION GRAPHICS:** Preparation of assets to be used for titles and selection of audio clips for titles and backdrop for scientific film.
- **DELIVERY, RELEASE & SHARING** training course covering: formats, versioning, outlets and networks, hashtags, metatags, platforms, channels, storage, automated social media and tracking metrics.

Media Skills School

EuPRAXIA Doctoral Network

EuPRAXIA-DN Film

Thus far ~20,000 views

Sustainable video production, use of AI, recognized as EU success story.

https://youtu.be/6NPgxCdffrE

EuPRAXIA-DN Newsletter

EuPRAXIA Doctoral Network

>>> Newsletter

Latest developments in plasma accelerator research and training.

>>> Highlights

EuPRAXIA-DN Camp I on Technologies held in Pisa

EuPRAXIA Seminar Series live for bookings

Meet our EuPRAXIA Doctoral Network Fellows – Part 4

>>> Welcome

New EuPRAXIA leadership and training excellence

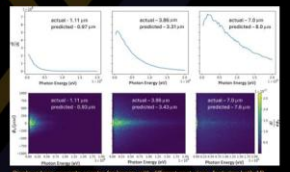
We have now launched our EuPRAXIA Camps, cutting-edge science focused workshops, that take place at EuPRAXIA partners across Europe. Our first Camp brought us to CNR in Pisa, Italy where we enjoyed the fantastic hospitality of our hosts and had excellent discussions about the technologies that will be required for future plasma accelerator-based research infrastructures. A number of talks will now be developed into full articles with our partner journal Instruments, and I already look forward to reading those papers. Many thanks to everyone who contributed to this workshop!

Our second Camp is already on the Horizon, and will take us to Lisbon, Portugal in July. This time, we will focus on the science program at EuPRAXIA and discuss a clear roadmap to experiments that will push the boundaries and allow us to fully exploit the science and discovery potential of EuPRAXIA. You will find details about the program in this newsletter, and I would advice you to register as soon as you can as the deadline is fast approaching, and places are strictly limited.

Prof Carsten P. Welsch
Coordinator

>>> Research Highlights

Reconstruction of beam parameters and betatron radiation spectra measured with a Compton spectrometer



Displayed are example spectra for beams with different spot sizes, featuring both 1D and double differential spectra. Each spectrum is tagged with its actual spot size followed by the predicted spot size, as determined by the direct 1D or double differential. ML models (M Yadav, et al., Phys. Rev. Accel. Beams 28, 042802 CC BY 4.0)

A recent study published in *Physical Review Accelerators and Beams* introduces advanced methods for reconstructing electron beam parameters and betatron radiation spectra using a Compton spectrometer. This work is particularly relevant for high-energy plasma wakefield acceleration experiments, such as those planned at the FACET-II facility at SLAC National Accelerator Laboratory.

The research team, comprising scientists from institutions including the University of California, Los Angeles; the University of Liverpool; and the University of Manchester, focused on analysing the photon flux generated when high-energy electron beams interact with intense electromagnetic fields. These interactions produce betatron radiation, which carries valuable information about the electron beam's characteristics. However, extracting precise beam parameters from the resulting photon spectra is a complex challenge.

To address this, the researchers employed simulated data modelling betatron radiation from plasma wakefield acceleration scenarios. They compared traditional maximum likelihood estimation techniques with modern machine learning approaches, including multilayer neural networks, to interpret the energy and angular distributions of the detected photons. By applying these methods, they successfully reconstructed key beam properties such as spot size, energy, and emittance with high accuracy.

Notably, the study demonstrated that machine learning algorithms could effectively handle the intricate relationship between the observed photon spectra and the underlying beam dynamics. This capability is crucial for optimizing beam performance in high-field environments and advancing our understanding of beam-plasma interactions.

The findings underscore the potential of integrating advanced computational techniques into beam diagnostics, paving the way for more precise control and analysis in next-generation accelerator experiments. As the field moves toward increasingly sophisticated setups, such methodologies will be instrumental in achieving desired beam qualities and enhancing experimental outcomes.

Further reading:
M. Yadav et al. Physical review Accelerators and Beams 28(4). 042802 (April 2025)
https://doi.org/10.1103/PhysRevAccelBeams.28.042802

>>> Network News

Joint LIV.INNO and EuPRAXIA-DN skills school hosted in Liverpool

The third cohort of LIV.INNO students were joined by researchers from EuPRAXIA-DN project to take part in an introductory skills school in Liverpool from 20th – 24th January 2025. The students undertook training in a range of skills which will help them while they undertake their PhD and prepare them for the world of work beyond their PhD.

Cutting-edge postgraduate researcher training schemes guarantee international competitiveness of the researchers trained and provide them with the necessary skills for a future career as researcher in either the academic sector or in industry. The concept for this course was developed by Professor Carsten P Welsch during the delivery of his previous training networks and has been praised in formal project reviews as 'best practice' in Europe.

On the first day the students were introduced to the school and given training in presentation skills by Dr Joe Wolfenden, LIV.INNO EDI co-ordinator. This session allowed the students to get to know each other a little better and help to prepare them for further presentation skills training later in the week.

Later that day Naomi Smith, LIV.INNO Centre Manager and Outreach co-ordinator, delivered sessions on Science Communication and Outreach. This allowed the students to understand why they need to communicate their work and how to go about it as well as preparing them for the week's task which was creating an outreach proposal.

On the second day Dr Fraser Robertson from Fistral delivered a session on Project Management. This ever-popular session allowed the students to better understand techniques they can use to manage their PhDs as well as helping them prepare their outreach proposal. The students also learned about the process of Peer Review from Dr Eva Vilella-Figueras of the University of Liverpool; a subject with which they will become more familiar as they produce their first journal papers.

On the third day the school relocated to Daresbury Laboratory. The students spent the morning honing their presentation skills further by giving presentations about their PhD projects and receiving detailed feedback from their trainers and their peers.

Students from EuPRAXIA-DN and LIV.INNO working together during the school. (Credit QUSAR Group)

>>> Upcoming Events

EuPRAXIA-DN School on Plasma Accelerators
22 - 26 April 2024, Rome, Italy

Several tens of thousands of particle accelerators are in use today with varied applications in research, industry, medicine and other fields. Yet accelerator usage could be much more widespread, were it not limited by cost and size constraints, especially in hospitals, universities, and small and medium size companies. This would enable ground-breaking applications and innovations on a much larger scale.

A possible solution to this bottleneck is the development of more compact – and consequently more cost-efficient – accelerator technologies, a strategy that has been investigated in the past two decades bringing forth plasma accelerators as one of its most promising candidates.

This interdisciplinary school will bring together all research areas within EuPRAXIA-DN and will be held in the 'Eternal City' Rome in Italy from 22-26 April 2024. Lectures and topical talks will be presented by research leaders from academia and industry.

The school will be organized in partnership with INFN and introduce the basic principles of plasma accelerators, including basic plasma physics, laser- and beam-driven acceleration, plasma injection schemes, plasma and beam diagnostics, particle-in-cell codes, as well as specific high impact projects, including EuPRAXIA and AWAKE.

Tutorial sessions in smaller problem classes will reinforce content and promote discussion. All participants will be given the opportunity to present their own research in a poster session.

Social events, an excursion to INFN-LNF, and a public talk on plasma accelerator science and technology will complement the diverse and interesting programme.

Several scholarships for early-stage researchers from outside of the EuPRAXIA Doctoral Network will be available.

For more information and to register please visit:
https://agenda.infn.it/e/eupraxia-school-on-plasma-accelerators

Registration deadline: 29th February 2024

The EuPRAXIA-DN School will take place at the Botanical Garden of Rome.

https://www.eupraxia-dn.org/newsletter

Prof Carsten P Welsch, EuPRAXIA Camp II – Science. Lisbon, Portugal – 14/15 July 2025

Outreach

EuPRAXIA Doctoral Network

International successes:

- Physics of Star Wars
- *Surfatron*

Social Media

All communication activities are supported by established social media channels:

@TheQuasarGroup, @lnf.infn.it

@quasar_6roup, @lnf_infn, @livuniphysics

EuPRAXIA, QUASAR Group Project T.E.A.M

Workshop overview

EuPRAXIA Doctoral Network

Contact in case of Emergency

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Alexandra	+44 75 51 91 48 31

Camp II – Overview

EuPRAXIA Doctoral Network

- In this challenge-led workshop we will look into the fundamental science that is enabled by plasma accelerators.
- There will be keynote talks in each session to “set the scene”
- These will be followed by R&D talks about the latest research, with plenty of time for discussion. A poster session this afternoon will cover an even wider area.
- Important: Get to know other participants – network, and become part of the EuPRAXIA family. Also: Get out of your comfort zone!

Enjoy the Camp!

EuPRAXIA

Doctoral Network

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