3rd I.FAST Annual Meeting

Future Horizon Europe projects for accelerators

José M. Pérez, on behalf of TIARA Collaboration

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Future Horizon Europe projects for accelerators.

An overvierw from TIARA

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1. On-going projects

1.1. Current on-going projects

FCC-IS

Future Circular Collider Innovation Study

H2020-INFRA**DEV**-2019-3. Nov 2020 - Nov 2024; 7.4 (3) M€

HITRI+

Heavy Ion Therapy Research Integration *plus*

H2020-INFRAIA-2020-1. April 2021 - Sept 2025; 5 (5) M€

iFAST

Innovation Fostering in Accelerator Science and Technology

H2020-INFRAINNOV-2020-2. May 2021 - April 2025; 10.6 (10.0) M€

EUROLABS

EUROpean Laboratories for Accelerator Based Science

HORIZON-INFRA-2021-SERV-01. Sept 2022 - Aug. 2026; 1.2 (0.9) M€

Recently approved projects

MuCol

A Design Study for a Muon Collider complex at 10+ TeV center of mass

HORIZON-INFRA-2022-DEV-01. March 2023 - Feb 2027, 7 (2.2) M€

RITIFI

Research Infrastructure and Technology Infrastructure For Impact

HORIZON-INFRA-2022-DEV-01. April 2023 - Sept 2025, 1.5 (1.5) M€

ESSnuSB+

Study of the use of the ESS facility to accurately measure the neutrino cross-sections for ESSnuSB leptonic CP violation measurements and to perform sterile neutrino searches and astroparticle physics

HORIZON-INFRA-2022-DEV-01. March 2023 - Feb 2027, 5 (2.2) M€

iSAS

Innovate for Sustainable Accelerating Systems

HORIZON-INFRA-2023-TECH-01-01. March 2024 - Feb 2028, 12.6 (5) M€

2. Main proposals recently submitted

2.1. Proposals sent to the last EC calls

5 proposals sent to the calls ending in March 2024: PRESTO (DEV), IFIGENEIA (WIDEA),
PACRI (TECH), ARTIFACT (TECH), EUMAHTS (TECH)

PRESTO

HORIZON-INFRA-2024-**DEV**-01. Submitted March 2024.

Pathfinder facility for a new class of PREcision Physics STOrage rings

Paolo LENISA
(U. Ferrara, INFN)

The PRESTO project will lay the foundations for a novel scientific infrastructure, which aims to **measure static and oscillating Electric Dipole Moments (EDM) of fundamental charged particles** with unprecedented sensitivity.
These measurements will be performed in a **highly sophisticated and yet-to-be-designed storage ring** that needs to control systematic measurement uncertainties to the highest possible scale.
PRESTO will provide a Conceptual Design Report (CDR) of such a Prototype Storage Ring (PSR) – as a pathfinder for the ultimate EDM-facility.

PRESTO addresses the dominance of Matter over Antimatter in the visible Universe and the Nature of Dark Matter.

- PRESTO ’s approach has never been attempted before: it exploits the measurement of static and oscillating Electric Dipole Moments of the proton by observing the spin of a polarised beam in a storage ring.
- Storage Rings combine long storage times with high-intensity beams.
- PRESTO will be essential to address the multiple challenges: beam storage time, spin-coherence time, stochastic cooling, electric bends and high electric fields, storage ring vaccuum, polarimetry, beam injection, ...

2. Main proposals recently submitted

2.1. Proposals sent to the last EC calls

IFIGENEIA

Innovative Facility for Isotope GENeration with Efficient Ion Accelerator

IFIGENEIA

Yannis Papaphilippou
Univ. Thessalonikis

HORIZON-**WIDERA**-2023-**ACCESS**-07, CSA (Excellence Hubs).
Submitted March 2024 (~5 M€).

The IFIGENEIA project aims at establishing a cutting-edge **linear accelerator (linac) facility in the Balkans**, to advance research and innovation (R&I) capabilities in the field of nuclear medicine and molecular imaging, with a specific emphasis on **radioisotope production for medical applications**. The project envisions the creation of three Excellence Hubs in Greece, Slovenia, and Cyprus, dedicated to developing a linac facility capable of producing a diverse range of marketable radioisotopes.

Phase 1: **LINAC design and definition of specifications**
Phase 2: **Radioisotope production**
Phase 3: **Investment plans and financing opportunities**. This phase explores sustainable business models for various stakeholders in the Nuclear Medicine domain formalizing practical yet economically viable solutions that can contribute to the scalability and replicability of IFIGENEIA.
Phase 4: Mentorship and Capacity Building

2. Main proposals recently submitted

2.1. Proposals sent to the last EC calls

PACRI

Plasma Accelerator systems for Compact Research Infrastructure

Gerardo D'Auria,
Elettra – Sincrotrone Trieste
Massimo Ferrario,
INFN Frascati
Leo Gizzi,
CNR Pisa

HORIZON INFRA-2024-**TECH**-01-01. Submitted March 2024.

1. Compact & efficient plasma accelerators (INFN)
2. Compact & efficient X-band technology for accelerators (Elettra)
3. Efficient high repetition rate Laser drivers (CNR)

A re-modulation of the CREATE proposal, with a special focus on plasma acceleration and new and more efficient technologies for accelerators.

- further developments on high-repetition-rate plasma modules, as the one foreseen by the EuPRAXIA project, extending its scientific domain to high average brightness radiation sources with possible future applications, also to high energy physics.
- the performance of normal conducting technology for linacs (X-band), aiming at extending their operating capabilities up to the kHz regime with the focus on efficiency and energy consumption, boosting the diffusion of extremely compact linacs and related X-ray facilities.
- the high-power high repetition rate laser technology to support the above-mentioned applications.

2. Main proposals recently submitted

2.1. Proposals sent to the last EC calls

ARTIFACT

ARTificial Intelligence For Accelerators, user Communities and associated Technologies (ARTIFACT)

Adnan Ghribi,
GANIL

INFRA-2024-**TECH**-01-01. Submitted March 2024, 15.8 (10.0) M€.

The objective ARTIFACT is to improve the efficiency of research infrastructures through digital transformation based on artificial intelligence (IA) techniques.
This could significantly reduce environmental impacts and energy consumption of RIs in all their phases of development, from design to commissioning, operation, and upgrades.
The specific objectives include:

- **development of guidelines for AI adoption and use at accelerator RIs and user communities;**
- **creation of a Pan-European AI enabled Accelerator Data Platform;**
- optimized control and modelling;
- reliable operation through fault detection, classification and prevention;
- standardised approaches and tools for implementation in RIs;
- training of RI staff and future researchers and engineers;

a network of 30 institutes (light sources, particle colliders)
7 Research Infrastructures on the ESFRI
Example Case 1. Laser-driven plasma accelerator (EuPRAXIA)
Example case 2. The SOLEIL infrastructure

WP2 includes a task dedicated to **industry engagement**:
Big-data industry, DataOps and MLOps industry, Predictive maintenance industry.
WP3 promotes the use of open-source tools/datasets, making training more accessible, reusable and aligned with industry.

2. Main proposals recently submitted

2.1. Proposals sent to the last EC calls

EU·MAHTS

Advancing HTS Magnet technology for EUropean Research Infrastructures

Luca Bottura, CERN

INFRA-2024-**TECH**-01-01. Submitted March 2024, 23.8 (9.9) M€

The objective of EUMAHTS is to develop an **integral program on High Temperature Superconductor (HTS) magnet technology**, towards higher field performance and higher energy efficiency systems, operating with minimal cryogenic needs and high (cryogenic) temperature for the development of compact, cost effective and sustainable instrumentation.

Translational: A transformational step for the operation of Research Infrastructures in Europe in different scientific fields, namely: High Energy Physics, Light Sources and Free Electron Lasers, Nuclear Physics, Materials and Life Sciences and Fusion, among others.

Social: EUMAHTS will benefit other fields such as are healthcare, energy and transportation.

Objective 1 – **Prototypes**: **Develop an all-HTS magnet technology** that will increase capacity and competitiveness of European Research Infrastructures for fundamental science and analytics.

Objective 2 – **Co-Innovation. Prepare European industry (*and ourselves!*) for a technology transition**, new applications and new markets that will be made possible by HTS magnets.

Objective 3 – **Strategic Roadmap**. Foster a **interdisciplinary, integrated, collaborative effort on HTS magnet technology** and its exploitation, engaging European Research Infrastructures, other research and academic bodies, and industry into a joint roadmap that will influence national and European strategic planning processes, guiding future choices in this field

3. Expectations for WP2025-2027 (and FP10)

3.1. HE RI Work Programme 2025-2027

Contacts from Feb 2022 to understand the EC view and transmit our aims.

HE RI Work Programme 2025-2027 Draft Orientation Paper.

Timeline:

- **2023-10-23: First version of the draft Orientation Paper**
- **2024-02-09: Workshop with Member States representatives.**

Update of the draft Orientation Paper

- **2024-02-28: Meeting with the Open Science and Research Infrastructures Unit (RTD.A.4)**
- **2024-04-01: Delivered a position paper requested by EC**
- **2024-06: Expected first outcome.**

Horizon Europe Research Infrastructures Work Programme 2025-2027

Draft Orientation Paper

This paper has not been adopted or endorsed by the European Commission. Any views expressed are the preliminary views of the Commission services and may not in any circumstances be regarded as stating an official position of the Commission. The information transmitted is intended to be indicative only.

This paper aims to identify the main challenges and the main objectives and impacts expected from actions to be launched as a result of calls for proposals in 2025-2027. These orientations will guide the shaping of the Research Infrastructures Work Programme 2025-2027.

3. Expectations for WP2025-2027 (and FP10)

3.1. HE RI Work Programme 2025-2027 Draft Orientation Paper

Novelties, pilots and preparatory actions are proposed, notably:

- **Sustainability and greening of RIs: synergies between European and national funding instruments. Other actions suggested for reducing the environmental and climate footprint of RIs.**
- **Integrated scheme for access to RIs: This should cover both curiosity-driven and challenge- driven access schemes. A preparatory action is suggested to explore a more integrated and sustainable access scheme.**
- **Fostering the deep tech potential in innovation ecosystems around RIs: Actions are suggested for co-creation and engagement with industry and spin-off applications of RIs technologies, as well as at the creation of stable innovation ecosystems for RIs technologies.**
- **A preparatory action is suggested to target common technology development by identification of commonalities in technology needs across different types of infrastructures and domains.**
- **International dimensions of RIs should be reinforced**
- **'AI for Science' should be supported, data for large scale AI research.**

…

3. Expectations for WP2025-2027 (and FP10)

3.1. HE RI Work Programme 2025-2027 Draft Orientation Paper

1.2. RI services to support large research domains, societal challenges and EU priorities [INFRASERV, Transnational Access]:

The objective is to continue enabling transnational access to research infrastructure services, while piloting a transition to new access models.

Both curiosity-driven and challenge-driven access should be funded, enabling bottom-up user proposals.

A preparatory action for a more integrated and sustainable access scheme is suggested to identify novel approaches and operational steps towards a longer-term, cross-domains and integrated access scheme.

It will build on the experience of past and ongoing EU supported access projects (notably under Horizon 2020 INFRAIA and Horizon Europe INFRASERV), on national access schemes, positions papers from relevant communities, and ESFRI work.

The consortium must be representative of all large domains.

The CSA will prepare the implementation of a pilot HE INFRASERV topic for 2027 (or for the next FP).

3. Expectations for WP2025-2027 (and FP10)

3.1. HE RI Work Programme 2025-2027 Draft Orientation Paper

1.3. Next generation of scientific instrumentation, tools, methods, and advanced digital solutions of RIs and fostering innovation and co-creation with industry:

Main objectives and expected impacts

- Continued support to the development of new instrumentation, tools, methods and solutions for RI upgrades, fostering the resilience of the RI landscape and EU autonomy -> Reinforce the supply capability of critical technical RI components.
- Creation of a stable RI innovation ecosystem that will also build on activities funded in the past on the development of RI technology roadmaps. -> Continuity
- There will be support for co-creation of technology with industry, notably to introduce new perspectives in design, opening up for new solutions, and seek longer-term engagement that leads to more robust innovation ecosystems.
- Maintained support for the greening of RIs. Encouraging advanced communities that have already developed technology roadmaps to incorporate greening challenges and exploring synergies with other communities notably for transversal technologies like ICT, robotics or AI.
- Transitioning to a more integrated and long-term planning and implementation of joint technology research, interacting also with preparatory action for common technology development.
- Exploration of applications of RI innovations outside the scientific market, via proof-of-concept support.
- Targeting all RIs in ESFRI (with other RIs as co-beneficiaries), grouped according to common technological roadmaps. The aim is to prepare communities with an existing roadmap for the longer term, and to stimulate other communities to develop their own technology roadmap approach.
- A preparatory action for common technology development is suggested to identify commonalities in technology needs across different types of infrastructures and domains. The action could map existing and developing strategies and roadmaps for future development of RI technologies by different RI communities in different domains.

3. Expectations for WP2025-2027 and FP10

3.2. TIARA Position

Regarding transnational access to RIs

- Willing to collaborate on defining a pilot action to prepare a long-term access program.
- Will help to coordinate with other consolidated communities the preparatory action.

Regarding next generation of scientific instrumentation, tools, methods and advanced digital solutions for RIs

- **Support a preparatory action for common technology development in ASc&T,** with the aim of **transitioning to a more integrated, long-term planning implementation** of joint technology research.
- During the WP 2025-27, ready to advance on the **development of the technology roadmap**.
- **Willing to promote the coordination with other consolidated communities and application fields** to foster synnergies.

  (clarification: each technological cluster will develop its own strategic roadmap)
- **In favor of a program based on long-range JRA** (Joint Research Action) projects, **complemented with smaller dimension, targeted actions** to reply to specific technological RIs needs.

- For the selection of these long-range projects, open calls for the technology clusters to present **proposals under competitive basis** is foreseen as a viable mechanism.
- We consider **cascade funding (*'internal projects'*) as a suitable internal instrument** to promote specific research and co-innovation sub-programs.

3. Expectations for WP2025-2027 and FP10

In summary, the most likely scenario: (to our best view interpretation)

Transnational access (INFRA-SERV):

- **A strong interest from EC to move from calls tageted to communities to an integrated, common program.**
- **The final format will very much depend on the position of the stronger communities.**

Next generation of scientific instrumentation (INFRA-TECH, IA, DEV, INNOV):

We need to be ready to prepare a pilot project:

- **for transitioning to a more integrated, long-term planning implementation;**
- **under which, we will have to develop the technology roadmap for ASc&T (integral, multidisplinary);**
- **in coordination with other consolidated communities and application fields;**
- **in which real co-innovation with industry will be essential;**
- **complemented with smaller dimension, targeted actions to reply to specific technological RIs needs.**

In competition with other technology clusters (no guaranteed slots per community)

Timeline. Expected: call open: Spring 2025; submission: ~October 2025.

If this estimation is confirmed, the preparation of the strategy and the fundamental parts of the integrated project might be started by end of 2024.

(Strength: IFAST has set the ground for this work, plus some of the recent projects and proposals submitted)