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CERN, 18 June 2024

I.FAST and Particle Accelerators

Innovation Fostering in Accelerator Science and Technology

An **Innovation Pilot**, supporting Innovation in Particle Accelerator technologies.

Comes after 4 successful Integrating Activities (CARE, EuCARD, EuCARD2, ARIES) started in 2004.



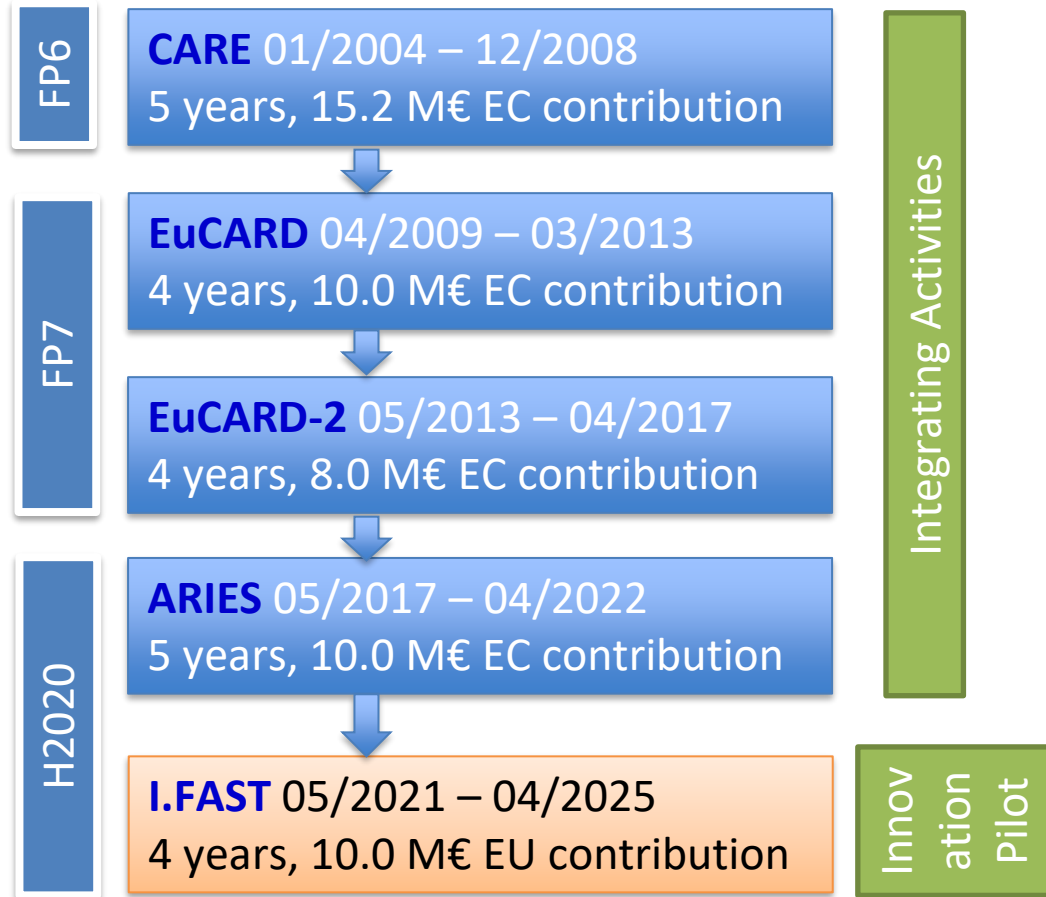
Particle accelerator community entering the age of open innovation:

Sharing of ideas between scientific institutions and companies, to improve high technology products and to identify new products and markets.

Creation of an *innovation ecosystem*

(Keywords: *community, trust, openness, creativity, connection to industry*)

20 years of general accelerator R&D in the European Programmes



EC support to accelerator R&D in two directions:

1. Design of new infrastructures and development of specific technology (higher TRL).
2. Support to multiple R&D topics (lower TRL) within large multi-national collaborations: four Integrating Activities and one innovation pilot have received 53 M€ EC funding in 20 years, with >50 M€ co-funding from partners.

Integrating Activities and Innovation Pilot: Development of cross-boundary technology subjects, not directly followed by large laboratories, with added value coming from collaboration and sharing of resources.

I.FAST is a new step in this progress, including for the first time a large industry representation (1/3 of Consortium)

Two main I.FAST messages of today

- It is about **open innovation** - creation of an ecosystem with industry to support R&D
- That cannot go via standard commercial procurement contracts and channels – building of trust
- The focus on **sustainability** – development of accelerator technologies that might have an impact on reducing accelerator dimensions or electricity, or both. We don't support specific projects, we look beyond.

Genesis and structure of I.FAST

- **Bottom-up** call in 2019, **101 proposals** submitted for:
 - **Strategies**: study groups to define “roadmaps” for specific technologies.
 - **Prototypes**: construction with industry of prototypes at high TRL, with EC contribution ~ 500 k€.
 - **Developments**: development, often with industry, of technologies at lower TRL, with EC contribution ~ 100 k€.
- **37** proposals selected by a special Committee on the basis of scientific excellence and coherence with the priorities of the accelerator community.
- Proposals grouped in 9 “**thematic areas**” (Work Packages), each made of a strategy with one or more prototypes and developments.
- 4 “**transverse**” WPs (Coordination, Training, Industry, Innovation).
- 1 M€ for a **second internal call** for proposals in **2023-25**.



9 thematic areas

WP	
1	Coordination, dissemination
2	Training, communication, outreach
3	Industry engagement
4	Managing Innovation, new Materials
5	New concepts, performance improvements
6	Novel particle accelerators concepts and technologies
7	High brightness synchrotron light sources
8	Innovative superconducting magnets
9	Innovative superconducting cavities
10	Advanced accelerator technologies
11	Sustainable concepts and technologies
12	Societal applications
13	Technology Infrastructure
14	Ethics Requirements

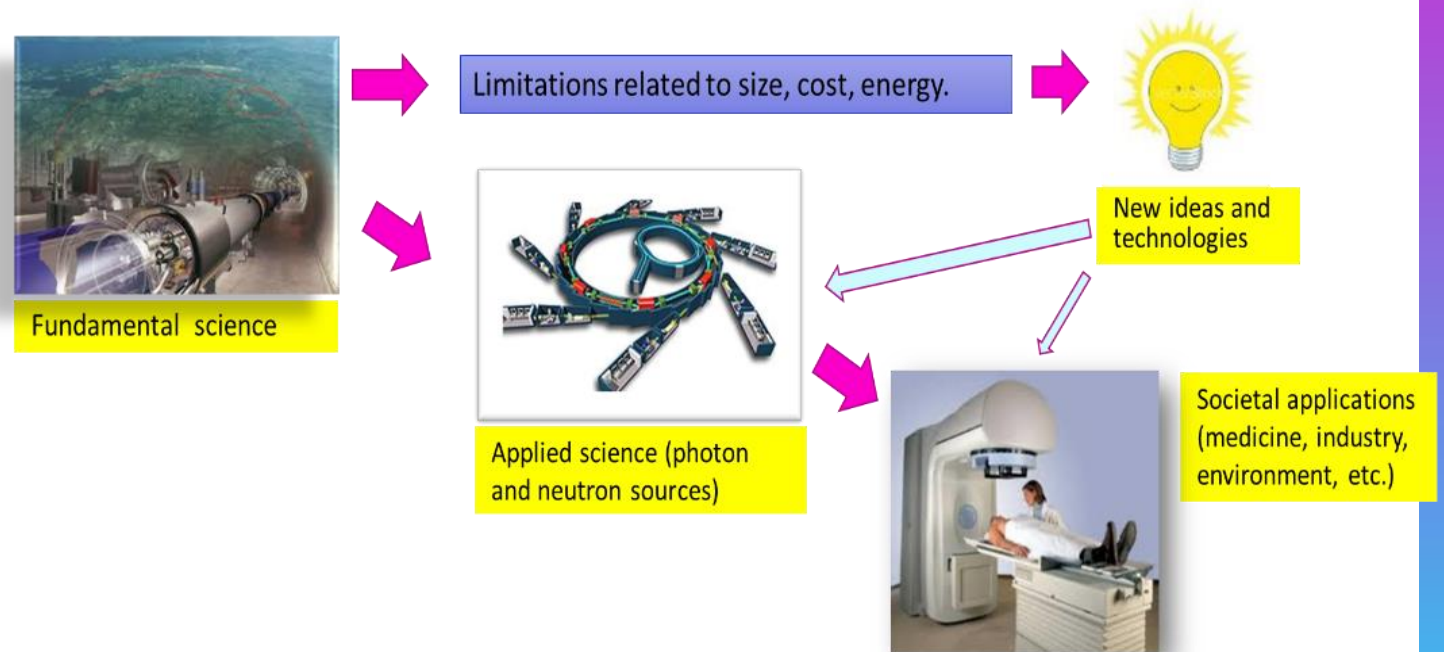
Each of the 37 proposals becomes a Task

The role of I.FAST in accelerator research

➤ For the entire XX century, **fundamental science** as driving force for the development of new accelerators, with its continuous quest for higher energies required to discover new particles.

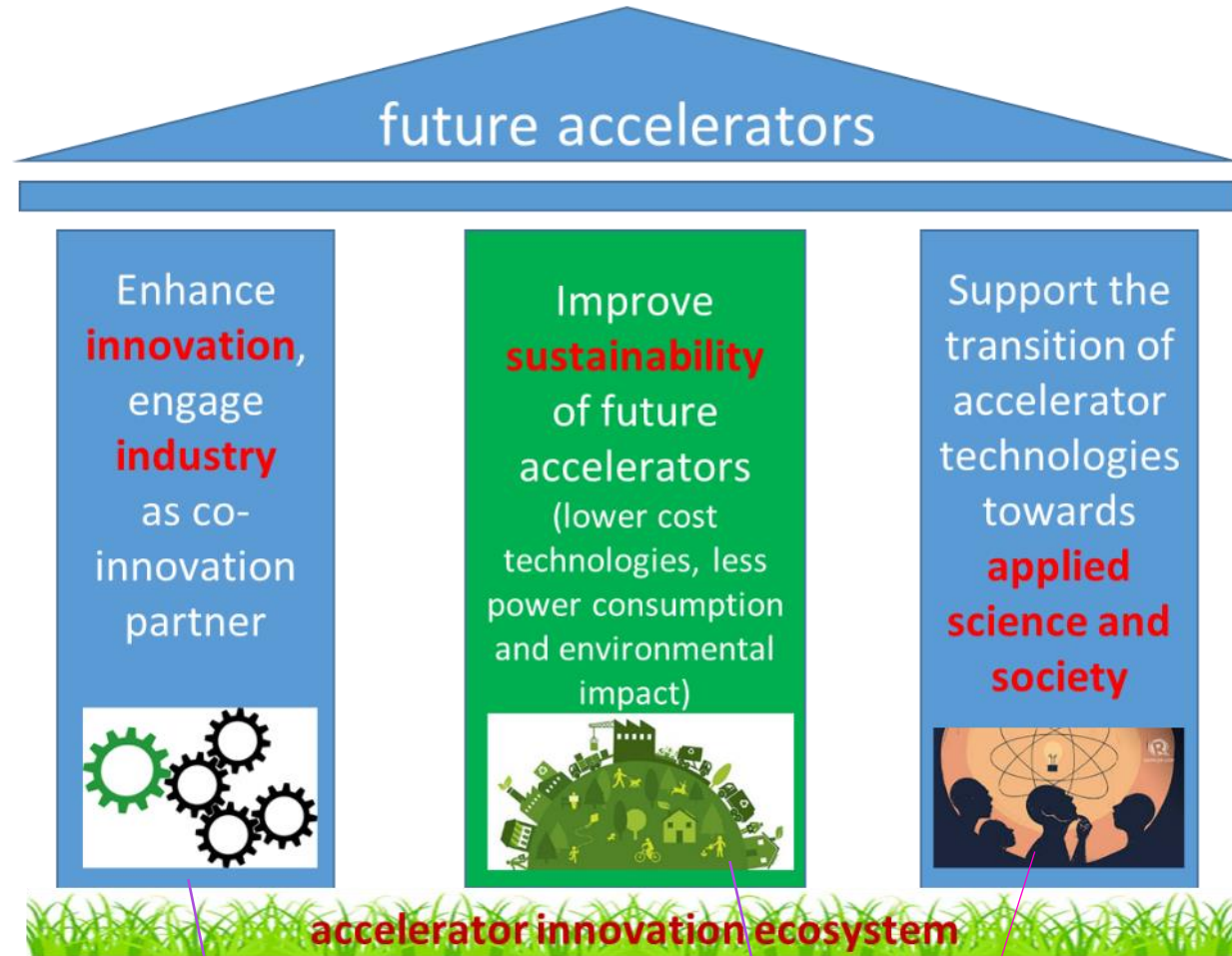
➤ Today, **extrapolating** present technologies to reach new physics goals may soon bring accelerators towards the **limits of sustainability** (dimensions, complexity, cost, energy consumption).

➤ In parallel, increasing demands are coming from accelerators for **applied science** (photon and neutrons) and **healthcare**, while new **societal applications** are appearing.



The scientific goal of I.FAST is to **support the development of new more sustainable technologies** for basic and applied science, promoting at the same time the **transfer of these technologies to society and to a wider accelerator market.**

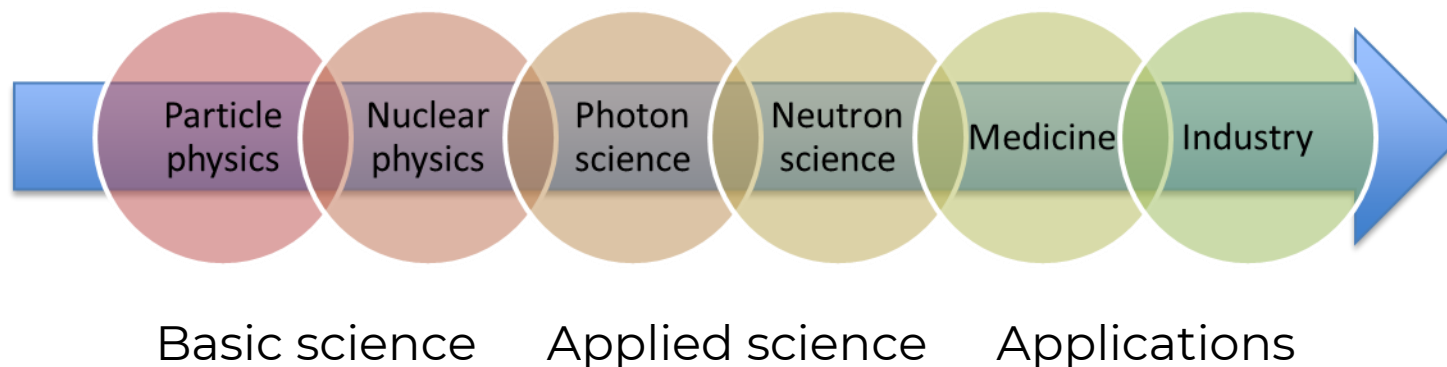
The three I.FAST pillars



- These goals correspond to the three I.FAST «pillars», which defined the priorities given in the **selection of I.FAST activities** following the bottom-up call.
- Additional focus areas: **training** and management of **technology infrastructure**.
- This strategy is coherent with the priorities announced in the **2020 Update** of the European Strategy for Particle Physics, and more at large with the priorities of the particle accelerator user communities.

I.FAST as a transverse project, from science to society

- Particle accelerators are sophisticated instruments used in a wide range of domains, from basic science to applied science to medicine and industry.
- Traditionally, the strongest demands in terms of technologies and performance are coming from particle physics, from which new technologies extend to other applications and finally reach the society.
- The main goal of I.FAST is the **translation of accelerator technology** across scientific fields and **to society**.



The European accelerator R&D landscape

- ❑ Translation of accelerator technologies is a particular challenge in the **fragmented European accelerator environment**.
- ❑ > 100 entities (research laboratories, universities, industry) active in research development and production of accelerator technologies, across 23 EU countries and UK.
- ❑ Only CERN stands up as a reference for accelerator R&D – but CERN’s contribution is institutionally limited to particle physics.
- ❑ Industrial landscape even more fragmented, with many SME’s producing accelerator components, but few with critical mass and even fewer capable of delivering a “beam”.
- ❑ An impactful R&D can be only achieved via large collaborations, in particular academia-industry.
- ❑ The European Commission Programmes plays a strategic role in setting up and supporting collaborations and co-innovation with industry.



Figure 4.1: Map of participants and countries involved in iFAST

The iFAST EU Project for accelerator R&D includes 48 partners (8 accelerator laboratories, 12 national research centres, 12 universities, 16 industrial partners (11 SMEs) - from 15 European Countries.

Wider goal and Consortium

- Wider goal (from the Commission's Work Programme):
“Demonstrate the role of Research Infrastructures in the translation of **Open Science** into **Open Innovation**”.
- Consortium of **48 beneficiaries**
8 large RI operators,
12 national research centres,
12 universities,
16 industrial partners (1/3), including 11 SMEs)



from 15 European Countries, supported by 12 partner organisations and >20 collaborating institutions, working on **40 R&D Tasks** to develop a portfolio of **technologies for the next generation of particle accelerators**.

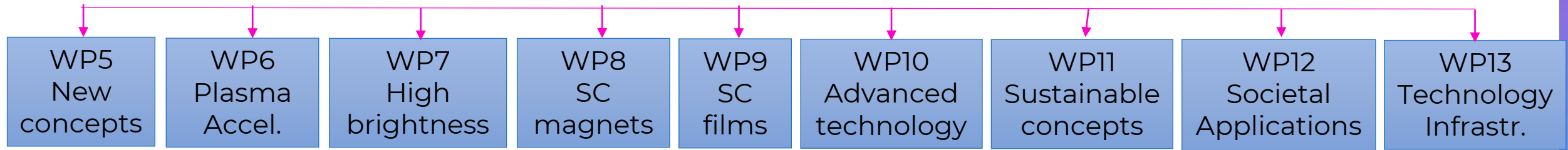
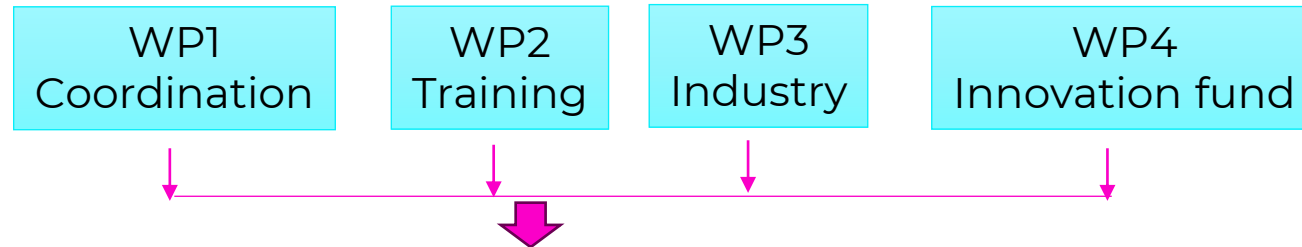
- Timeline: **4 years**, starting 1 May 2021.
- Resources: **10 M€** EC contribution, out of a total project cost of about **19 M€** (co-funding principle).



iFAST Topics and structure of Annual Meeting

iFAST activities cover 9 thematic areas, strategic for the future of particle accelerators.

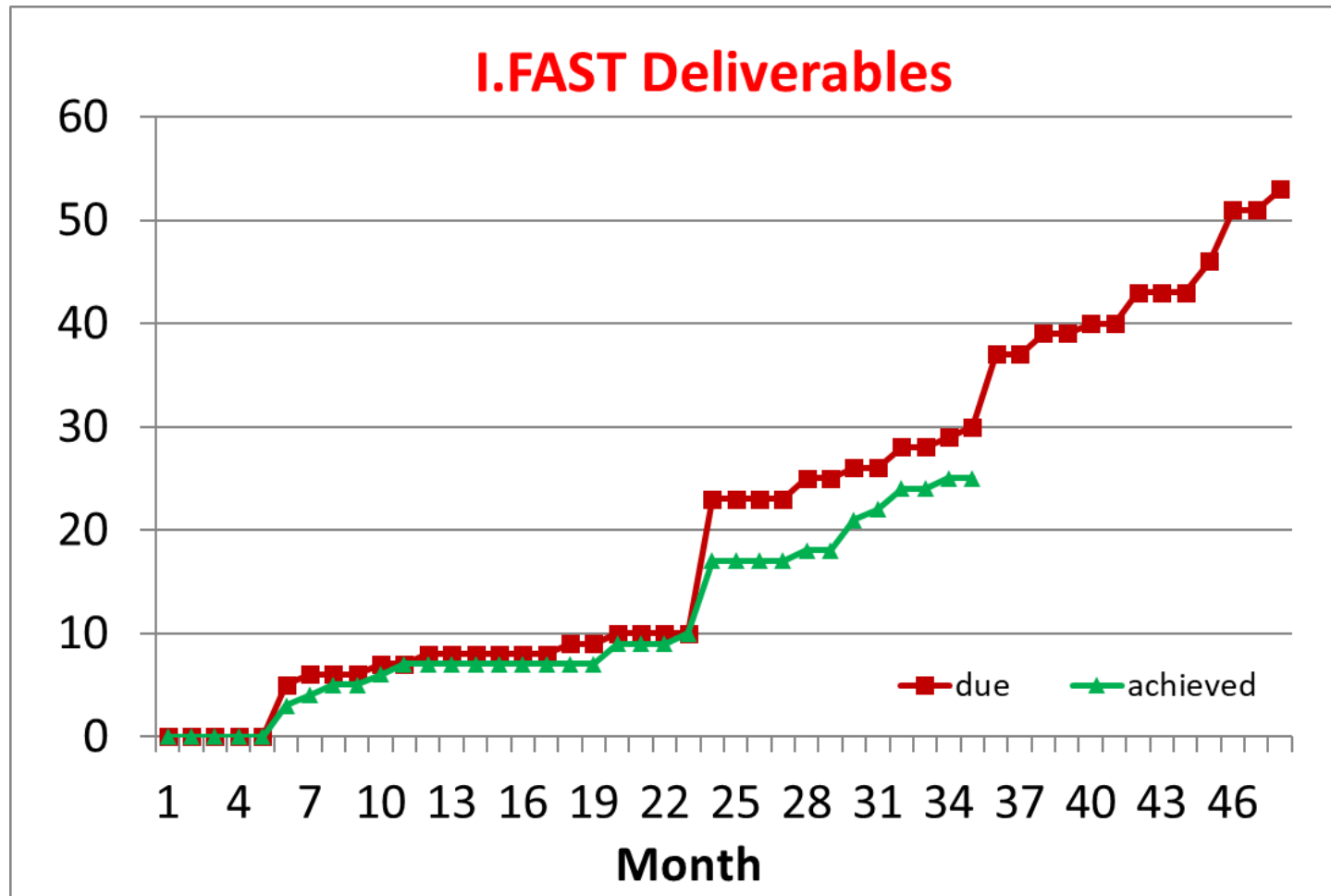
4 support Work Packages and 9 thematic Work Packages



The presentations at this meeting will cover the ongoing activities (by Work Package or by Task), with the goal of presenting:

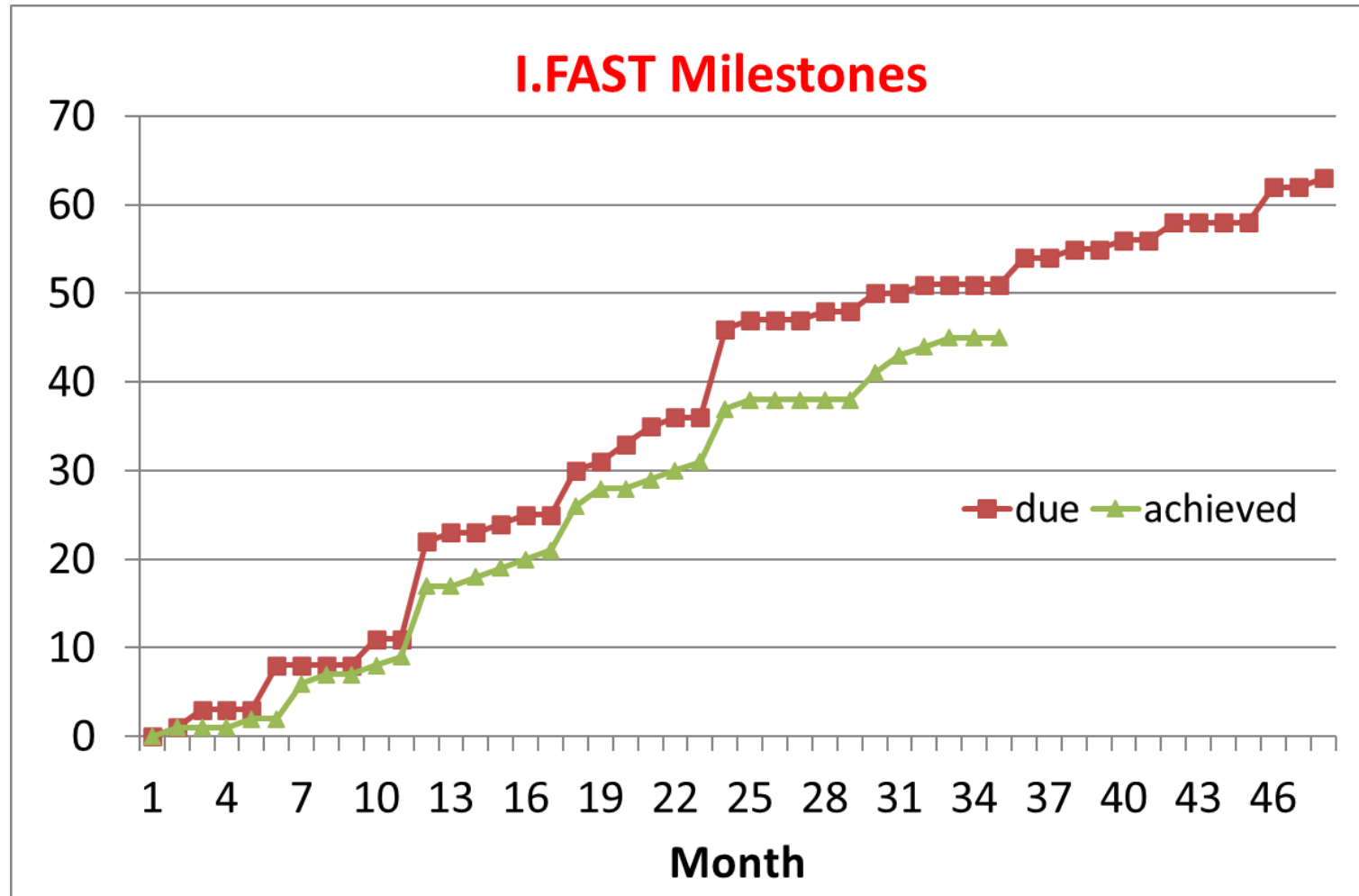
- a. recent work and results, to trigger discussion and exchange.
- b. status of deliverables and potential problems or delays.

Status of Deliverables



At end of June we have to submit the 2nd periodic report

Status of Milestones



Some problems...

Many minor issues linked with recruitment or loss of critical personnel, remaining Covid impact at the beginning of the Project, minor technical issues, but only one major problem:

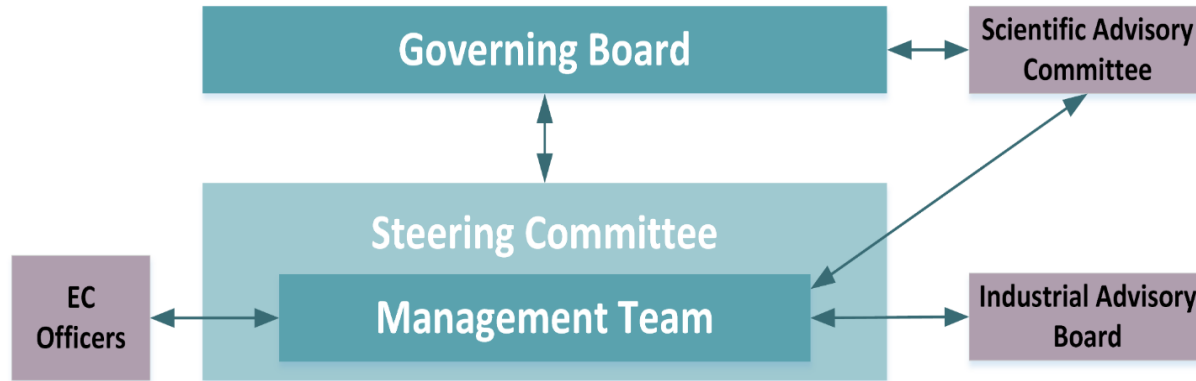
The increase of material and energy costs (and related inflation and delays in deliveries) due to the ongoing worldwide crisis.



Strong impact in particular on industry, cost of prototypes to be realised was defined in 2019.

Mitigations: redistribution of work between partners to reduce costs (but increase risks), descoping of some activities (e.g. smaller prototypes), ...

Activities in P1 – management, governance



- Establishment of a Consortium Agreement
- Set-up of all projects Bodies













All meetings and minutes are registered in Indico: <https://indico.cern.ch/category/13033/>

Scientific Advisory Committee

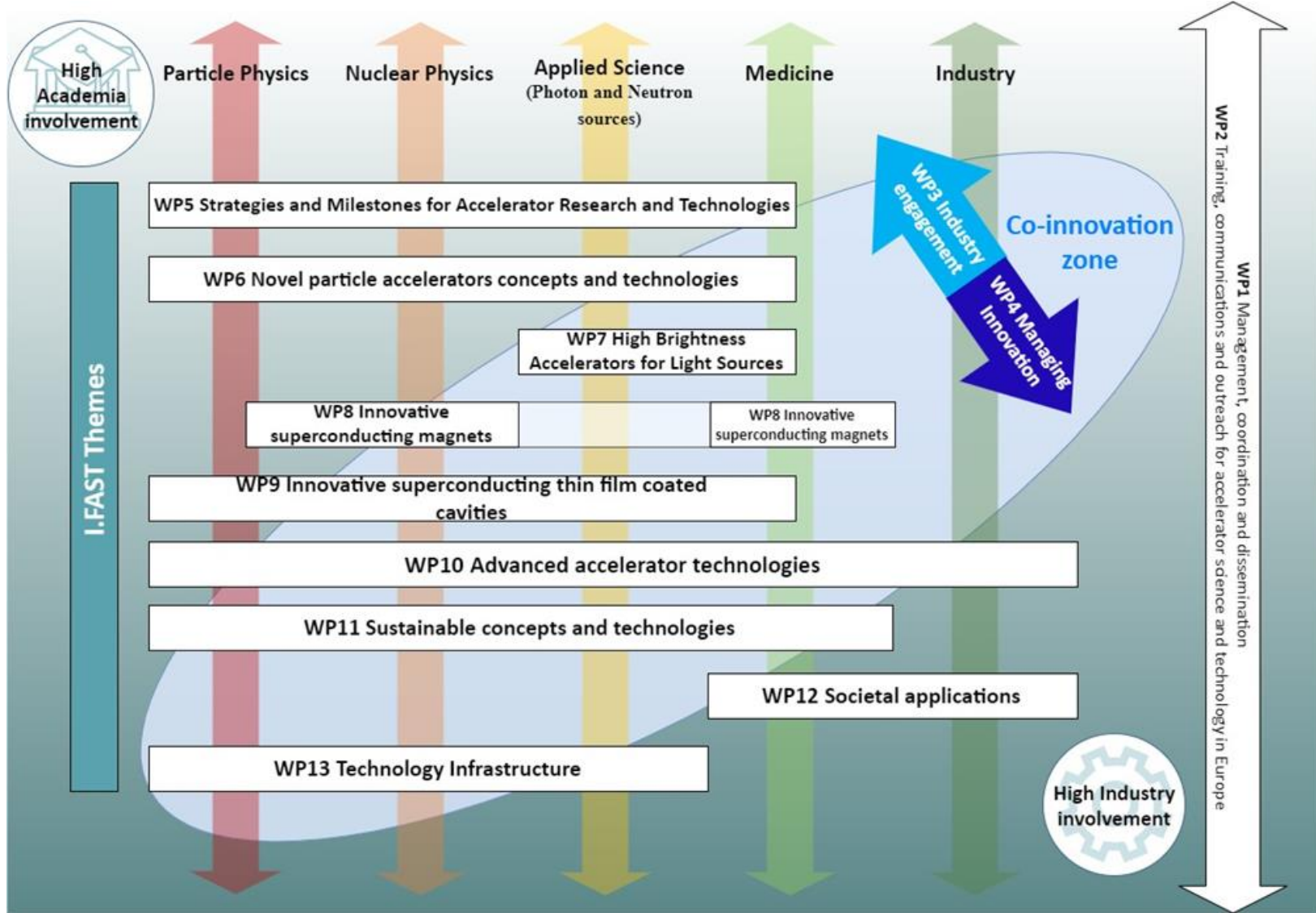
- **Akira Yamamoto (KEK)**, Head of Linear Collider Project Office at KEK, expert in applied superconductivity, already member of EuCARD2, ARIES and AMICI SAC.
- **Michiko Minty (BNL)**, Head of Accelerator Division at the BNL Collider Accelerator Department, with wide experience in accelerator design and beam optics.
- **Carsten Welsch (U. Liverpool)**, Head of Physics Department at U. Liverpool, has participated in many accelerator projects, with expertise in beam instrumentation and optics, science communication and outreach, etc.



IAB Members

	Spela Stres IAB Chair - Director of the Center for Technology Transfer and Innovation (CTI)
	Miguel Angel Carrera Founder and CEO of AVS
	Ronald Dekker CEO - Demaco
	Francesco Fantini Sales manager Big Science Division - Fantini Sud S.p.A.
	Pavel Hedbavny CEO - Vakuum Praha
	Rok Hrovatin Senior BD advisor - Cooylab
	Olivier Tasset - Maye Sales Manager - Sigmaphil
	Charles Mangeot Senior R&D Engineer, Product Specialist, Piezoelectric Actuators - CTS Corporation
	Ziad Melhem Founder and CEO - Oxford Quantum Solutions Ltd
	Michael Peiniger Managing Director - Research-Instruments
	François Sylla Co-founder and CEO of SourceLAB
	Josef Troxler Business Development Manager, Ampegon & OCEM, Power Electronics

Information flow and dissemination



Periodic Report 2 – technical part

- Covers the second **18-month period** (October 2022 – April 2024)
- Must be submitted 2 months after end of period (**30 June 2024**)

❑ **Task Leaders** have received a template to be filled in with a **description of activities (October 2022 - April 2024)**: summary, objectives, description of work, meetings, milestones, deliverables, publications, justifications for delays or late Deliverables and Milestones. **2/3 pages per Task.**

❑ **End of April 2024**: deadline for **sending the contributions to Valérie**, who assembles the WP Sections and sends them to WP Coordinators for validation.

❑ **15 May 2024**: deadline for WP Coordinators to send WP chapters to Valérie.

❑ **End of May**: complete document sent to WP Coordinators for approval.

❑ **End of June**: Report ready for submission.

Reminder: no complete report, no money !



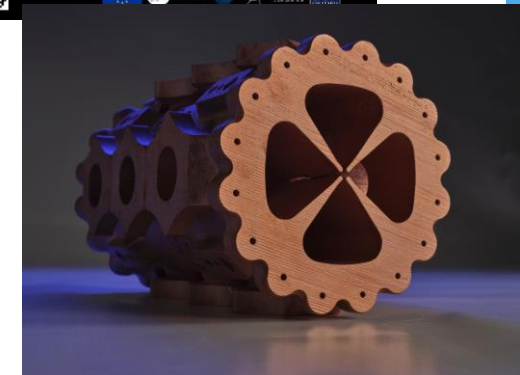
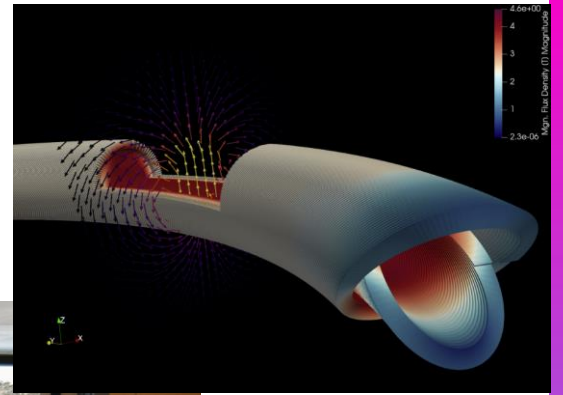
I.FAST 3-year highlights

Judging from the articles in Accelerating News: 15 articles on I.FAST activities, featuring

- Challenge Based Innovation (4 articles)
- Academia-Industry exchange programme (3 articles)
- I.FAST Innovation Fund (2 articles)
- additively manufactured copper components and RFQ (2 articles)
- ion therapy SC magnets
- advanced accelerator concepts event
- rare earths for permanent magnets: blessing or curse?
- accelerators to combat biohazards



You have some achievements to report? Contact our editorial team!



SAC Observations and recommended actions

SAC Message	Proposed Action
I.FAST (application) technologies to be assessed with regards to a realistic pathway to identified markets and time scales required. Get idea of TRL. Note if developments happening because of I.FAST.	Prepare list of I.FAST technologies. Questionnaire from WP3: TRL, envisaged pathway, time scale, role of I.FAST.
Diversity: improve gender equality (e.g. at Annual Meeting)	Diversity session at Annual Meeting, still low number of female speakers (17% academia, 12% industry)
Communication: more stories in the web site, I.FAST brand more visible in Workshops	Send reminder to Task Leaders
Connection between individual projects/events and wider WP and project not always made clear enough	Introduction to Annual Meeting
CBI: wider promotion and improve diversity	More promotion through universities, approach directly small countries (with sponsors)
Prepare continuation of selected activities after I.FAST	Presentation at Annual Meeting
I.FAST as an information hub for training opportunities	To be implemented (via TIARA?)



3rd Annual Meeting and still growing!

3rd Annual Meeting of the **Innovation Fostering for Accelerator Science and Technology** Innovation Pilot Project of Horizon 2020.

141 registered participants for the three days of I.FAST plenary sessions (0.5 days and 9 participants more than in 2023), 76 registered participants for the Industry Workshop: **largest attendance ever!**

Programme highlights:

- ❑ Industry Workshop on Cryogenics in Big Science.
- ❑ Industry Session, Wednesday 17/04 16:00 (8 speakers from industry).
- ❑ Session on Sustainability challenges for large RIs
- ❑ Diversity and Innovation panel discussion.
- ❑ Parallel and future Horizon accelerator projects,
- ❑ **iFAST** + Governing Board Meeting



The poster for the I.FAST 3rd Annual Meeting features a collage of images: a large red brick building, the Eiffel Tower, and various scientific equipment. The text on the poster includes the event title, dates, location, and a detailed programme.

iFAST

I.FAST
3RD ANNUAL MEETING

16-19 April 2024
Cité Internationale Universitaire de Paris

The I.FAST (Innovation Fostering in Accelerator Science and Technology) project is organising its 3rd Annual Meeting in Paris, France, in collaboration with CEA and CNRS. The project as well as the activities and recent results of the different work packages will be presented.

Programme

- **Tuesday 16 April**
 - Parallel Meetings
 - Industry Workshop on Cryogenics in Big Science
- **Wednesday 17 April**
 - Industry Workshop on Cryogenics in Big Science
 - Plenary Sessions
- **Thursday 18 April**
 - Plenary Sessions
- **Friday 19 April**
 - Final Session

Organising Committee

- Maud Baylac (CNRS)
- Valérie Brunner (CERN)
- Antoine Le Gall (CERN)
- Sylvie Leray (CEA)
- Anne-Laure Pelé (CEA)
- Maurizio Vretenar (CERN)

A QR code located in the bottom right corner of the poster.

I.FAST has received funding from the European Union's Horizon 2020 Research and Innovation programme (GA No 101004730)

Recap of the messages

- It is about **open innovation** - creation of an ecosystem with industry to support R&D
- That cannot go via standard commercial procurement contracts and channels – building of trust
- The focus on **sustainability** – development of accelerator technologies that might have an impact on reducing accelerator dimensions or electricity, or both. We don't support specific projects, we look beyond.

Strategic importance of CERN

- CERN is I.FAST project coordinator – this requires vision, mission, leadership and scientific diplomacy
- However, in terms of participation in I.FAST, CERN has a rather small monetary share
- only 8.8% of the I.FAST R&D budget goes to CERN
- This is why we will see today at CERN only limited technological developments of I.FAST - 91.2% of the I.FAST work is done outside CERN

iFAST

Thank you for your attention!



This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under GA No 101004730.