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Project Coordinator

Period 2 Review, 15.07.2024

Interaction and meetings in P2

Annual Meeting 2023
Trieste (I), 10-21 April

132 in presence, 39 online

Annual Meeting 2024
Paris (F), 16-19 April

147 in presence

Industry Workshops:
- High Temperature Superconductivity
- Cryogenics in Big Science

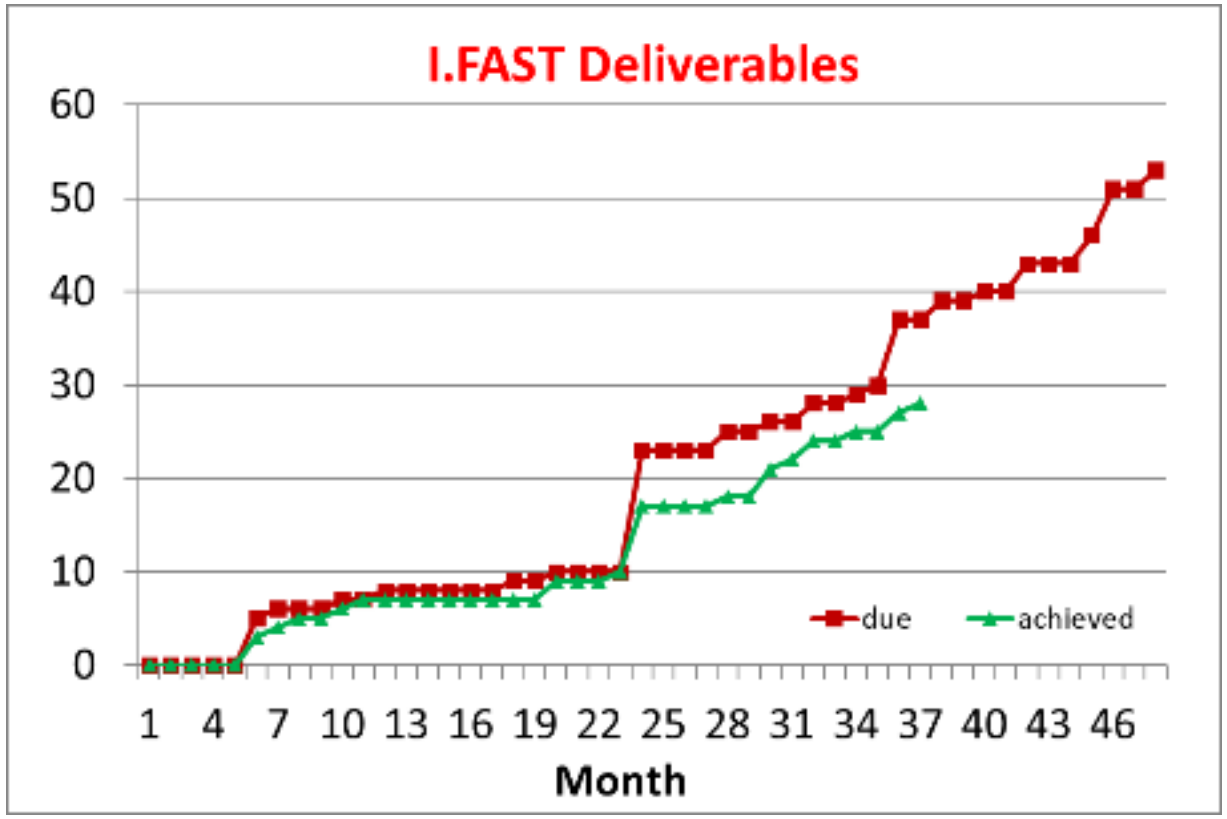
Multidisciplinary Sessions:
- Artificial Intelligence
- Sustainability

7 Steering Committee meetings (online)
2 Governing Board meetings (hybrid)

Main issues during P2

- Update workplan of WP8 after withdrawal of 2 industrial partners.
- Identify and apply mitigations for the increase in material costs seriously impacting the construction of prototypes.
- Follow-up of personnel and technical problems related to some high-level prototypes and apply mitigations to reduce delays.
- Advertise more widely Industry Training scheme.
- Integrate in the Consortium new partners contributing to Innovation Fund projects.
- Replace two WP Coordinators retiring or taking new position.

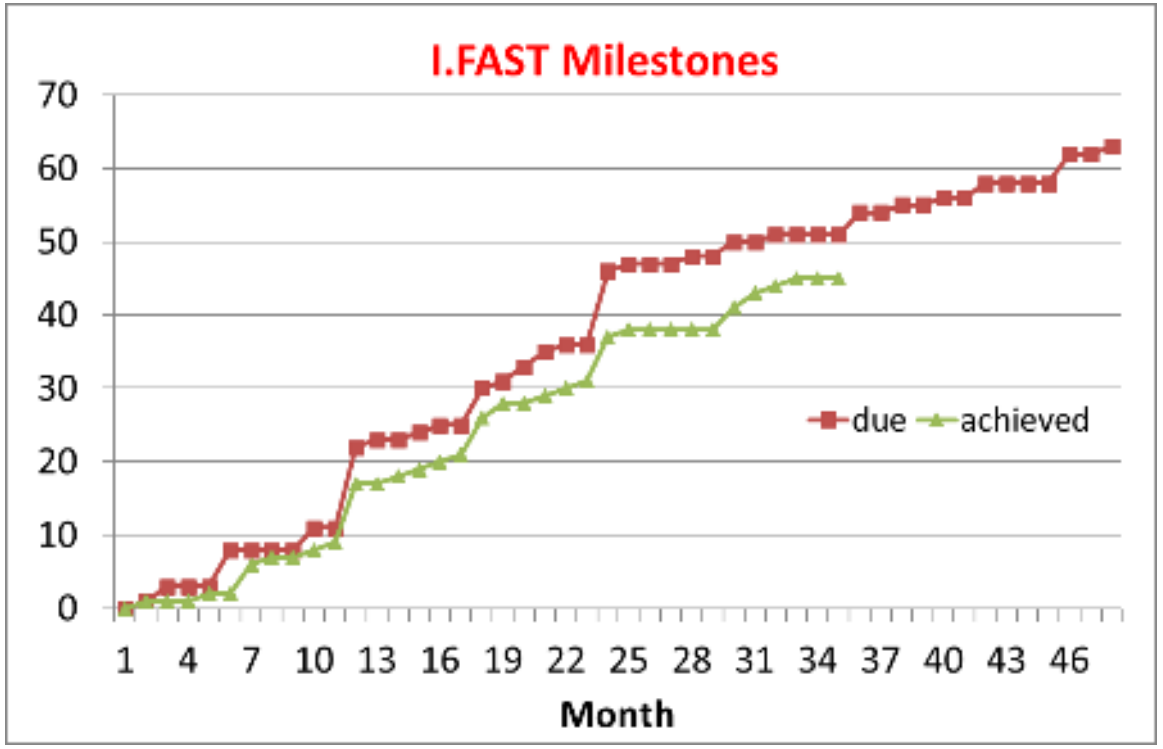
Status of Deliverables



Del.		Due date (M)	Status	New date (M)
D4.1	Evaluation criteria for IIF projects Evaluation Body	20	Delivered	
D2.2	Challenge-Based Innovation scheme	24	Delivered	
D2.3	Industrial training scheme	24	Delayed	48
D4.2	IIF Projects awarding	24	Delivered	
D4.4	Production of large-size CCM plates	24	Delivered	
D6.3	Electron acceleration experiments with new targets	24	Delivered	
D7.5	Construction of the acc. structure pre-prototype	24	Delayed	42
D10.2	Survey of AM applications and strategies	24	Delivered	
D10.6	Electro-optic performance report	24	Delivered	
D12.2	Basic engineering of e-beam sludge processing line	24	Delivered	
D12.3	Prototype of Internal RF Ion Source for Cyclotrons	24	Delivered	
D13.1	Strategy for the development of the AMICI	24	Delivered	
D13.2	Development and promotion of services to industry	24	Delivered	
D13.3	GaN RF amplifier module at kW level	24	Delivered	
D11.3	Prot. adjustable PM quad. and comb. function magnets	28	Delayed	44
D12.1	Strategy for novel societal applications of accelerators	28	Delivered	
D10.1	Potential AM applications in accelerators	30	Delivered	
D4.3	Beam-windows prototypes	32	Delivered	
D8.6	Fast-cycling Nuclotron HTS cable design	32	Delivered	
D10.5	Technical Report on machine learning at ESS	34	Delayed	46
D9.1	Thin-Film SRF roadmap report	35	Delayed	45
D3.2	Business development case report	36	Delivered	
D3.3	Extended industrial contributions in R&D activities	36	Delivered	
D6.4	Improvement of laser intensity stability on target	36	Delivered	
D7.6	Construction of the acc. structure full prototype	36	Delayed	48
D9.3	First 6 GHz cavity coated and characterised	36	Delayed	46
D10.4	First PSD data from NEG coating	36	Delayed	44
D11.2	Klystron prototype completed and validated	36	Delayed	44

19 Deliverables out of 28 foreseen for P2 have been provided, for the remaining 9 a delay is requested (explanations given in the next slides)

Status of Milestones



19 Milestones out of 24 foreseen for P2 have been achieved, for the remaining 5 a delay is requested (explanations given in the next slides)

Milestone		Due date (M)	Status	New date (M)
MS60	First Plasma achieved on the prototype.	19	Achieved	
MS10	Collection of feedback from industrial partners and RIs participating in I.FAST	20	Achieved	
MS31	Construction readiness of curved CCT demonstrator	20	Achieved	
MS30	Construction and RF tests of CompactLight accelerating structure prototype	21	Delayed	48
MS61	Organization of the workshop	21	Achieved	
MS52	Workshop on efficient magnet- and RF power supplies	22	Delayed	38
MS18	Present and future AI accelerator applications	24	Achieved	
MS20	Engineering design of improved power supply current measurement and RF-amplifier layout	24	Achieved	
MS21	Report on the novel accelerator landscape in Europe, facilities, projects and capabilities at the beginning of the 2020's	24	Achieved	
MS24	Hypothesis on the causes of the instabilities of the focal spot profile	24	Achieved	
MS26	Magnet specifications based on optics calculations for ELETTRA.	24	Achieved	
MS28	Electromagnetic and mechanical design of the two guns	24	Achieved	
MS36	HTS Nuclotron cable produced	24	Achieved	
MS40	Construction and operation of the cavity dedicated ALD system	24	Achieved	
MS45	Survey on current AM repair technologies for accelerator and list of possible applications	24	Achieved	
MS59	Approval of basic engineering	24	Achieved	
MS56	Magnets constructed and tested	25	Delayed	38
MS37	International thin film workshop organization	28	Delayed	42
MS44	Survey on current AM applications in accelerators and expected new developments	30	Achieved	
MS22	LASPLA Workshop/School	30	Achieved	
MS34	Construction of the combined formers for CCT winding	32	Delayed	42
MS11	IIF Projects interim progress	36	Achieved	
MS16	International workshop to define R&D plans	36	Delayed	38
MS41	A facility for laser operation for complex 3D treatment is tested on 1.3 GHz cavity	36	Delayed	43

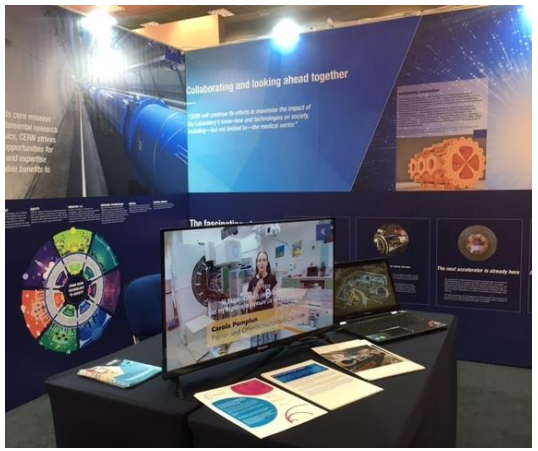
Late Deliverables and Milestones

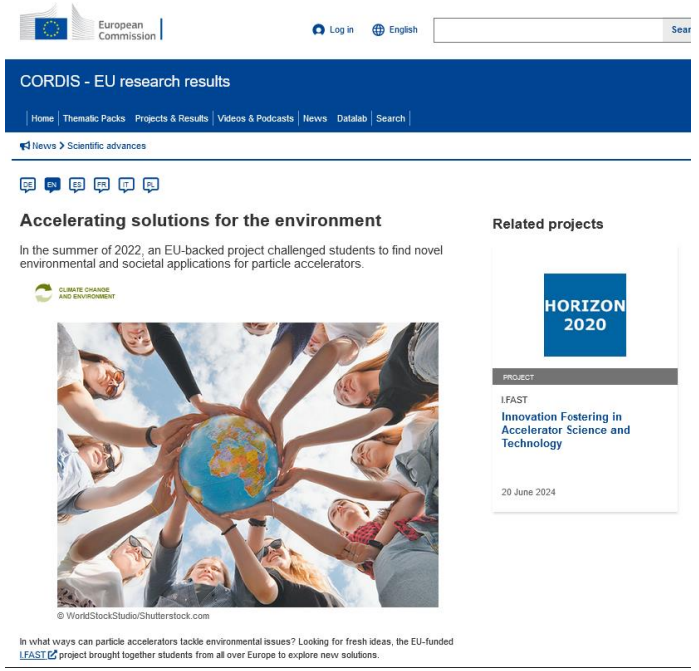
		Due date (M)	New date (M)	Justification (details in PR2)
D2.3	Industrial training scheme	24	48	Moved to end project, to have more applications
D7.5	Construction of the acc. structure pre-prototype	24	42	Lack of specialised personnel, failure of mechanical brazing
D11.3	Prot. adjustable PM quad. and comb. function magnets	28	44	Redesigned to reduce material cost and lack of design resources
D10.5	Technical Report on machine learning at ESS	34	46	Waiting for data after shift in ESS facility commissioning schedule
D9.1	Thin-Film SRF roadmap report	35	45	Delayed by MS37
D7.6	Construction of the acc. structure full prototype	36	48	Delayed by D7.5
D9.3	First 6 GHz cavity coated and characterised	36	46	Technical issues and wrong date in initial proposal
D10.4	First PSD data from NEG coating	36	44	Technical problems cause 1-year delay to test during yearly shutdown
D11.2	Klystron prototype completed and validated	36	44	Procurement delays and failure of subcontracted parts

		Due date (M)	New date (M)	Justification (details in PR2)
MS30	Construction and RF tests of CompactLight accelerating structure prototype	21	48	Failure of brazing
MS52	Workshop on efficient magnet- and RF power supplies	22	38	Replacement of expert who moved to other job
MS56	Magnets constructed and tested	25	38	Redesign needed to reuse old components
MS37	International thin film workshop organization	28	42	Workshop moved to 09/24 after Covid
MS34	Construction of the combined formers for CCT winding	32	42	Withdrawal of partners
MS16	International workshop to define R&D plans	36	38	Minor delay in reporting
MS41	A facility for laser operation for complex 3D treatment tested on cavity	36	43	Technical problems

I.FAST Dissemination and Outreach

- 50 scientific publications produced during P2 (average of 2.8/month), all available Open Access on https://zenodo.org/communities/ifast .
- 15 articles on the “Accelerating News” newsletter, 1 article in the “CERN Courier”, 1 article in CORDIS, 38 articles in specialised press and in web bulletins.
- Participation in exhibitions and fairs

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Accelerating solutions for the environment
In the summer of 2022, an EU-backed project challenged students to find novel environmental and societal applications for particle accelerators.
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In what ways can particle accelerators tackle environmental issues? Looking for fresh ideas, the EU-funded I.FAST project brought together students from all over Europe to explore new solutions.
Related projects
HORIZON 2020
PROJECT
I.FAST
Innovation Fostering in Accelerator Science and Technology
20 June 2024

Evolution of consortium and management team

6 New members joined the Consortium (3 industry, 2 academia, 1 foundation):

- **TERA-CARE Foundation** (WP5) and **Goethe University Frankfurt** (WP10) joined as partner organisations participating in the I.FAST activities with no EC contribution (providing some PM of personnel resources).
- **CSIC** (Consejo Superior de Investigaciones Científicas, SP), **Ceraco ceramic coating GmbH** (D), **HZDR Helmholtz Zentrum Dresden Rossendorf** (D), **SBI GmbH** (AT) joined as partner organisations to participate in the I.FAST Innovation Fund with no direct EC contribution (they will receive funding from CERN for material costs and provide personnel resources).

2 changes of WP Coordinators:

- WP6: **M. Ferrario** (INFN) has replaced R. Assmann (DESY) who moved to another position.
- WP4: **F. Carra** (CERN) has replaced (with L. Garolfi responsible of the Innovation Fund) M. Losasso (CERN) who took an early retirement.

Actions after PR1 Reviewer's Comments

- ***"Training, communication and outreach activities and also some technical problems encountered during the RP1 requires immediate actions".***

This comment concerned the "Industrial Training associated with Knowledge Transfer" that was undersubscribed during P1. A modification of the programme, defined in P1 report, has allowed extending it to work in both directions, from academia to industry and from industry to academia. Advertisement of the programme has been increased, presenting it at relevant conferences and workshops, and a successful case has been presented on the "Accelerating News" newsletter. This has resulted in 3 projects being supported in P2, up from 1 during P1. Technical problems have been addressed, leading to a constant progress for all the concerned Tasks.

- ***"Special care should be taken for, especially, the loss of critical personnel and recruitment throughout".***

Recruitment problems were solved, but delays are difficult to compensate and impact on delay of production for some Deliverables.

- ***"The delayed milestones and deliverables should be achieved and delivered".***

All the Deliverables due during P1 have been produced, and all Milestones for P1 have been achieved, except one (MS5, Accelerator Communication Workshop), delayed because of unavailability of personnel. Other delays have unfortunately appeared during P2.

- ***"The number of significant results in accelerator developments from the thematic Work Packages should be increasingly delivered".***

The 19 Deliverable reports produced during P2 (more than one per month) present a large number of significant results. All the prototypes foreseen in the Work Plan are nearing completion.

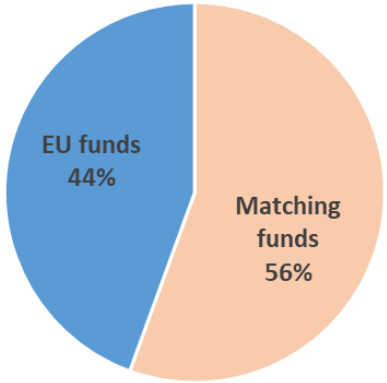
- ***"As one of the main objectives of the project is to promote co-innovation with industry, it is expected that efficient networking, training and also innovation fund management are critical during the future work".***

During P2, collaboration with industry has been enhanced, via a new Accelerator Industry Permanent Forum that will continue after the end of the action. A dedicated structure has been set up for follow up of the Innovation Fund, meeting regularly with the participants. A complete business analysis has been produced for a test case.

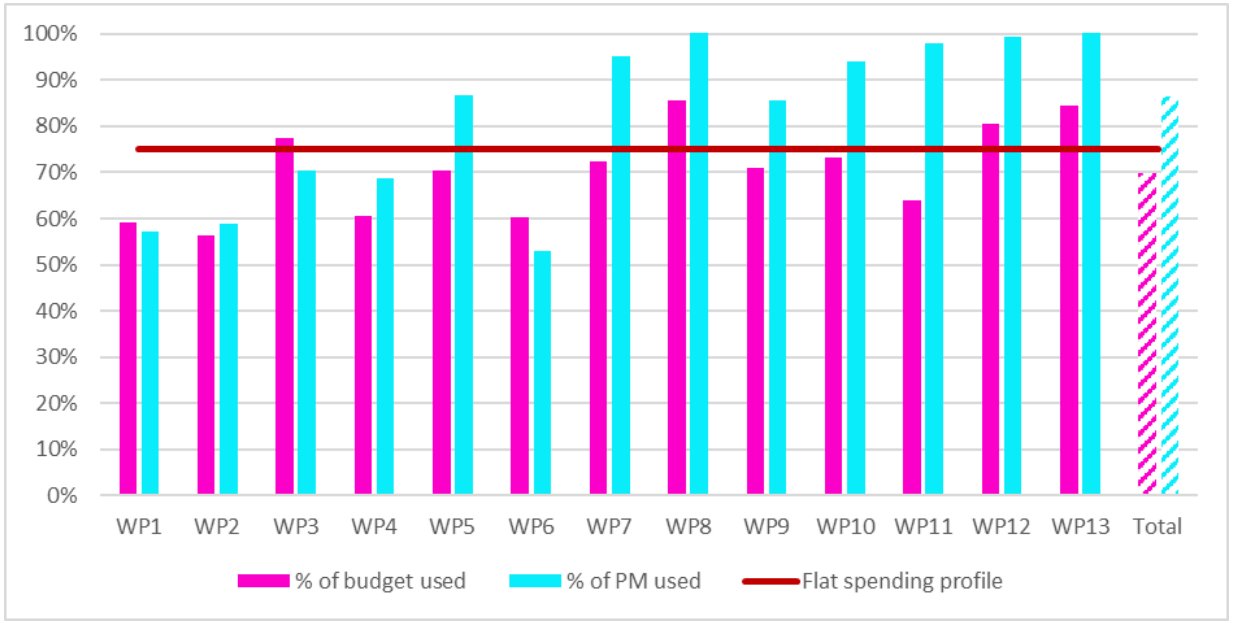
Use of resources: Context

- I.FAST activities are funded by EU funding (**~8M€** of direct costs), but matching funds (**~10M€**) are also needed to fully implement the work plan. The full estimated budget of I.FAST is **18.38M€** of direct costs.
- Some I.FAST activities were planned with “common pot” at CERN, to be distributed to selected Beneficiaries during the project implementation, e.g: I.FAST Innovation Fund (800k€ direct cost, EC contribution), Industrial training with KT (63k€).
- Unexpected events had to be compensated with redistribution of tasks and associated budget between Beneficiaries (e.g: WP8 withdrawal of 2 industrial partners)

The Maximum Grant Amount per Beneficiary had to be revised accordingly



Use of full resources from M1 to M36 (P1+P2) per WP

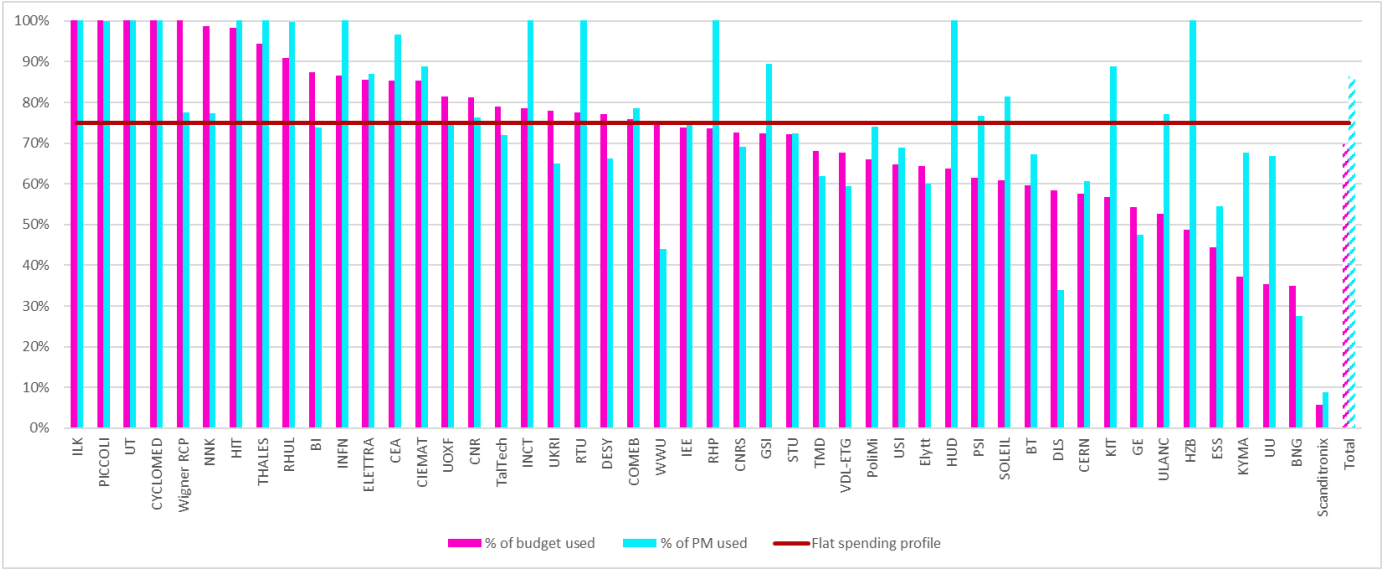


- WP under-using the full resources:
  - WP1: **59%** of full cost budget used, **57%** of full PM used: will have reporting work in P3.
  - WP2: **57%** of full cost budget used, **60%** of full PM used: Covid, less industrial training
  - WP6: **60%** of full cost budget used, **53%** of full PM used: Covid, transfer of collaborators

- WP over-using the full resources:
  - WP8: **86%** of full cost budget used, **108%** of full PM used: to compensate for withdrawn partners
  - WP13: **83%** of full cost budget used, **110%** of full PM used: activities completed in P2.

Use of full resources M1 to M36 (P1+P2) per Beneficiary

- Sorted from highest % of total full costs (budget) utilisation, to lowest

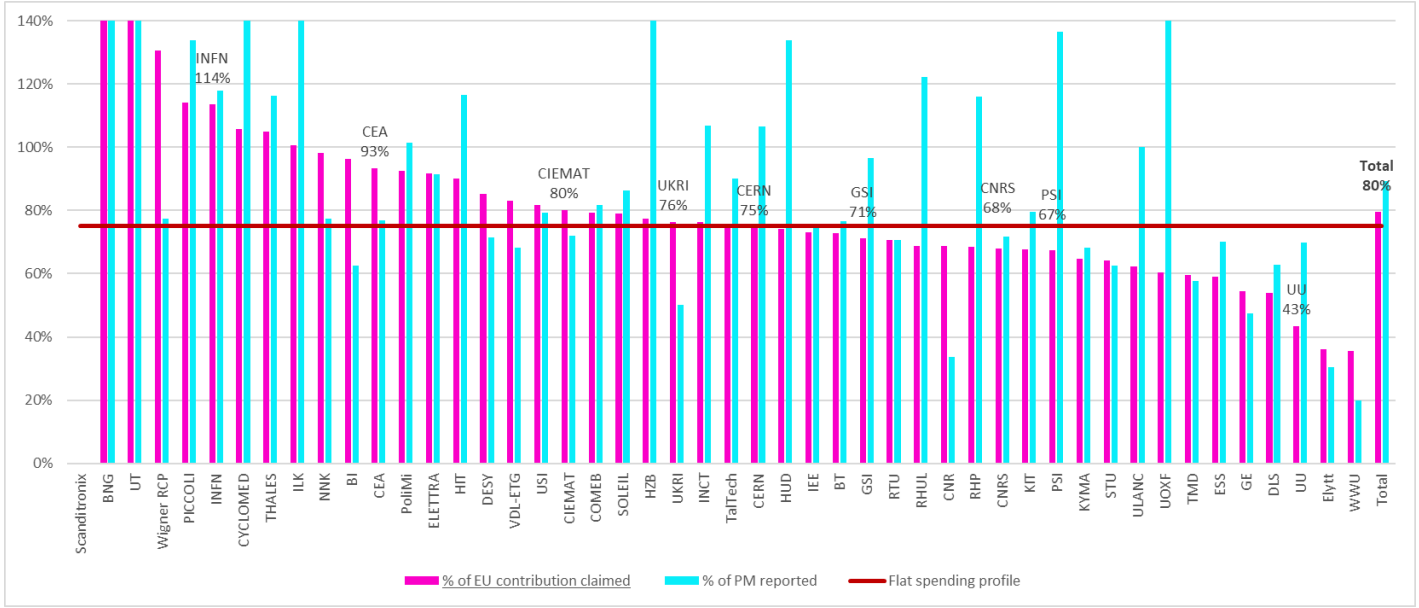


- Total Consortium:
  - **12.82M€** out of the total 18.38M€ (**70%** of the total full costs used)
  - **1,563 PM** out of the total 1,808 PM (**86%** of the total full person-month used)

Use of EU funded resources from M1 to M36 (P1+P2) per Beneficiary

- Requested EU contribution (P1+P2):

In overall, **80%** of the maximum grant amount has been requested as EU contribution (**7.966M€** out of 10M€), even if we can notice various situations from a beneficiary to another



- The highlighted institutes (CERN, INFN, CNRS, PSI, CIEMAT, GSI, CEA, UU and UKRI) are the main beneficiaries, cumulating 60% of the I.FAST maximum grant amount

Highlights P2: impact

- Success of the 2nd edition of the **I.FAST Challenge Based Innovation on "Accelerators for the environment",** with large resonance and articles in the specialised press. A 3rd edition on "**Accelerators for health**" is taking place in 2024, mostly supported by donations from research institutions and sponsors (only 2 editions were foreseen in the I.FAST work plan).
- **Industry engagement** is strong (70 participants to 2024 industry workshop!) leading to the institution of the **Industry Accelerator Permanent Forum** that will continue after the end of I.FAST.
- Studies of a **Muon Collider** as a smaller-size alternative to future colliders that was supported by an I.FAST exploratory group is now officially recognized by the ESPP and by the approval of the MuCol HORIZON-INFRA-2022-DEV-01 Design Study supported by I.FAST
- Coordination with the **INFRA-INNOV communities** (photon sources and detectors) progressed towards a common strategy submitted to the RI Unit of DG/RTD, a common organisation of the 2024 Industry Workshop, and a common booth at BSBF (10/24).
- The **I.FAST Innovation Fund** has attracted more companies and has efficiently started its activities.

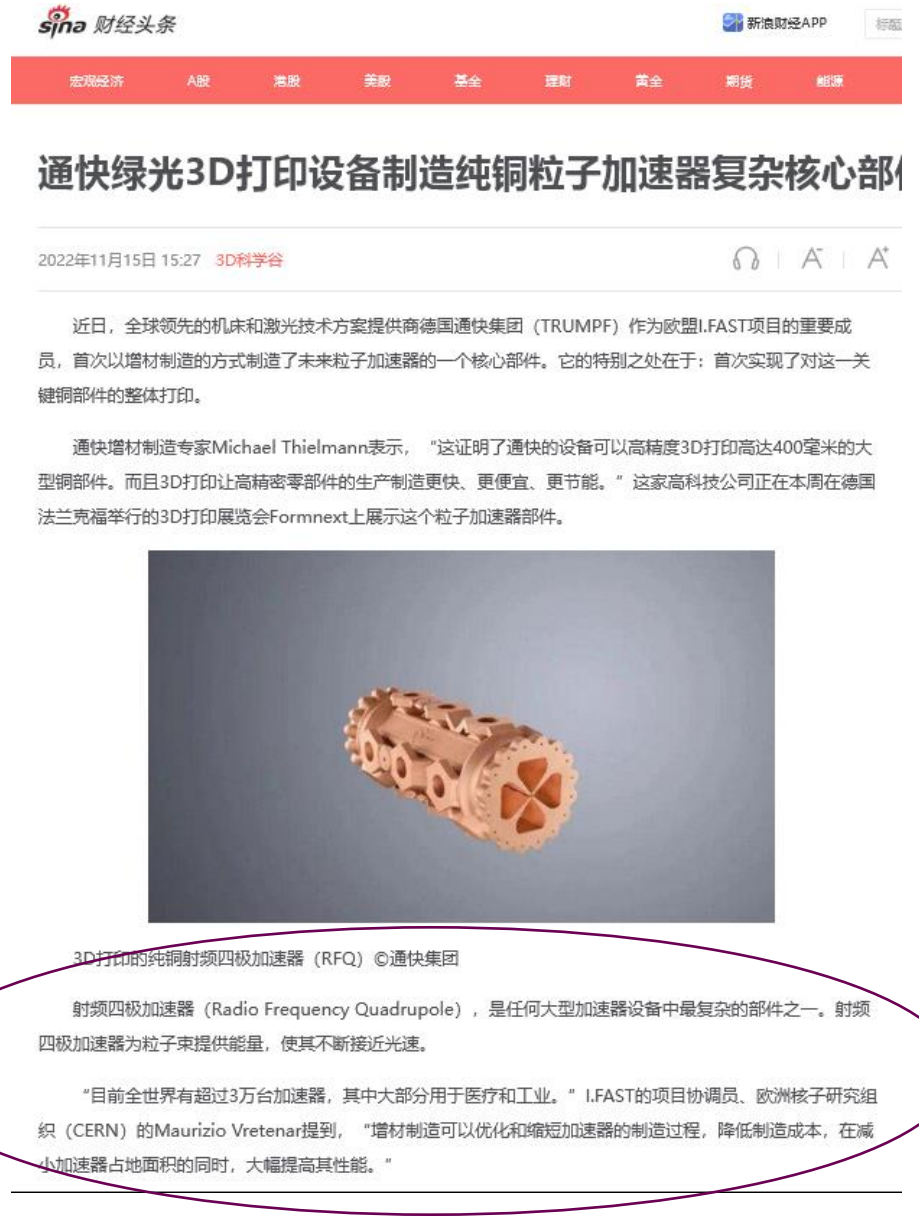
Highlights P2: hardware

Some of the **high-level I.FAST prototypes** are coming up with interesting results and start to have wide resonance in the scientific and technological world.

- More prototypes of **Additive-Manufactured Radio Frequency Quadrupole** (RFQ) “miniature accelerator” were produced in industry (at no charge, as contributions to the development) and presented at international exhibitions. Full characterization is going on at CERN in the frame of a large collaboration (WP10).
- The first prototype of **high gradient injector** (RF gun) for FEL light sources has been successfully tested (INFN-LNF, COMEB, PSI).
- A high efficiency **1 kW power amplifier module** has been produced and tested (Uppsala Univ., CERN).

I.FAST in China…

“SINA” web bulletin, 15/11/2022
https://t.cj.sina.com.cn/articles/view/2422410454/90630cd6001015hju?finpagefr=p_103



Outlook to P3

We expect that by the end of P3, I.FAST will have fully **achieved its primary goals** of developing a portfolio of new accelerator technologies, in an environment of open sustainable innovation, impacting accelerator science and society as large.

There are however **delays** in the production of some of the high-level prototypes foreseen in the work plan, due to a combination of factors:

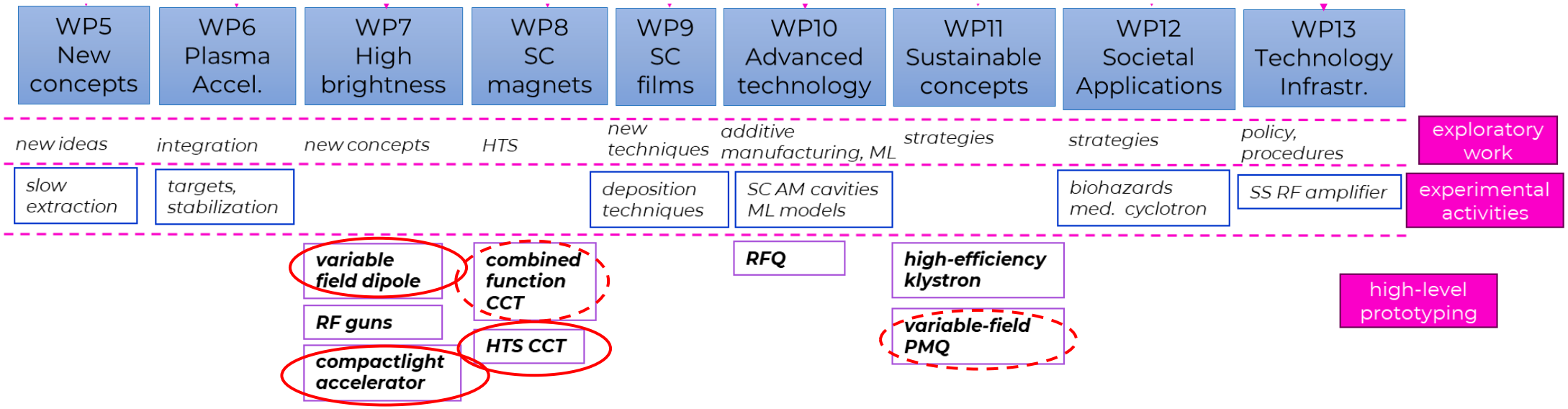
1. The Covid pandemic that slowed down activities during the first year (2021).
2. Initial difficulties to find the expert personnel required for some complex I.FAST activities.
3. The material cost and energy crisis of 2022/23 that forced to revise the work plan, implementing creative solutions to remain within the allocated budgets.
4. Technical problems that as usual appear when advancing high-technology developments (first-of-a-kind objects!).

There are serious risks that for some of the prototypes, although completed or close to completion at the end of the project, there will be not enough time to finalise the measurements or the assembly and to provide complete deliverable reports.

Motivations for a 6-month extension

A 6-month project extension (to October 2025) will mitigate the risk of not being able to provide complete deliverable reports for the prototyping Tasks of I.FAST.

The Governing Board at its April 2024 meeting has given mandate to the Coordinator for a request in this sense to the Project Officer.



= *Prototypes at risk of not having completed assembly or measurements by April 2025*

iFAST

Thank you for your attention!

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