

# I.FAST

Innovation Fostering in Accelerator Science and Technology

Horizon 2020 Research Infrastructures GA n° 101004730

## DELIVERABLE REPORT

### IFF Projects Awarding

#### DELIVERABLE: D4.2

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#### ABSTRACT

This deliverable reports the activity implemented by the Evaluation Board in the process of selecting and awarding the Internal innovation Fund (IFF) to the projects that have competed to the I.FAST call for proposals launched in May 2022. In total 8 projects were awarded the 1.235 M€ of budget allocated to the fund.

I.FAST Consortium, 2023

For more information on IFAST, its partners and contributors please see <https://ifast-project.eu/>

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### Delivery Slip

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## ***Executive summary***

*This deliverable reports the activity implemented by the Evaluation Board in the process of selecting and awarding the Internal Innovation Fund (IFF) to the projects that have participated to the I.FAST internal competition launched with a call for proposals in May 2022. Also it reports the activity necessary to implement the fund transfer to the new partners organization that have joined I.FAST community as a result of their awarded project.*

## **1 Introduction**

In the scope of the WP4 activities it is included the implementation of an internal fund to support new initiatives in the second phase of the IFAST project, the Internal Innovation Fund, IIF. This work has required the definition of priorities for new innovative developments inside the project, and according to these, it has been necessary to set up the structure for a competitive call for cutting-edge innovation-oriented projects in collaboration with industry. The design of the IFF has been based on the acquired experience from the ARIES Prof-of-Concept, on the total budget allocated by the project and it has been structured in such a way to target intersections between the 9 thematic areas of IFAST and EC priority agenda, contributing in tackling similar priorities while connecting accelerator community and society at large.

More specifically, the underlying idea of IIF is to engage industries with IFAST participants, to develop innovative ideas potentially able to impact the environment and sustainability of Particle Accelerators. According to this main drive, since end of 2021, Task 4.1 has defined and prepared the criteria of evaluation for IIF, has discussed internally to WP4, extended the discussion to WP3 contribution and to STC, has proposed an Evaluation Body to the Governing Board (GB) for appointment, has managed the Call for Proposal (CfP), and eventually has started disseminating the initiative. The criteria publicly disclosed at the opening of the Call for proposals include several aspects as innovation capacity, impact potential, quality of the projects in term of the way proposed to run it with the dedicated team, the use of resources allocated, the time schedule. Eventually also a scoring model was disclosed and distributed to the evaluators to make easier their work. All these are available at the link: <https://ifast-project.eu/iif>

The IFAST community has replied successfully, as at the deadline of IIF submission, on September 15th, 18 projects were proposed.

In the following it will be reported the details of the evaluation process.

## 2 Process of Evaluation

### 2.1 EVALUATION BOARD

The Criteria to Evaluate and Select the projects to the fund have been prepared by WP4, discussed and approved by Steering Committee and Governing Board in several specific meetings, the last of which was on April 2022, just before the launch of the Call for proposal (CfP). The Criteria had to keep into account the declared objective of the IIF, its budget, the I.FAST timeline and the wish to involve industries and enlarging the participation to the project. At the same time, specific criteria were necessary in order to ensure equality of treatment among the projects, and a fair and independent judgment based on a uniform set of rules. Indeed an independent Evaluation Body (EvB) was proposed by WP4 and appointed by GB to work out the evaluation based on the agreed set of rules. The composition of EvB was including representative of industries, the chair of the Industry Advisory Board (IAB) in IFAST, several WP in IFAST, and was chaired by the WP4 leader. The EvB members were requested to declare the eventual evidence of Conflict of Interest.

The EvB composition is reported below:

G.Bisoffi	INFN	
M.Baylac,	CNRS	
A. Faus Golfe,	IJCLAB, Orsay	IAB chair
P.Fork,	GSI	
R.Geometrante	Kyma SpA	
Z.Melhem,	Oxford Quantum Solutions Ltd	
M.Losasso,	CERN	EvB chair
M.Morandin,	INFN	
M.Vretenar,	CERN	IFAST PC, ex-officio

## 2.2 CRITERIA OF EVALUATION

The Evaluation of the projects has accounted 3 main Criteria each subdivided in 3, 2 and 3 sub-criteria. The Criteria were Quality, Impact and Implementation, subdivided into:

- 1.1. Innovative Aspect of the proposal not covered by similar research activity
- 1.2. Clarity and Pertinence of the objectives
- 1.3. The extent to which the proposed work is beyond the state-of-the-art and demonstrates innovation potential (e.e. ground breaking objectives, novel concepts, and approaches new products and services).
  
- 2.1. The extent to which the outputs of the project would enhance innovation capacity, involve industries and create new market opportunities, reinforcing competitiveness and growth of companies or bring other important benefits to society especially in reference to climate change challenges
- 2.2. Quality of the proposed measures to disseminate and exploit the project results, including management of IPR
  
- 3.1. Soundness of the concept, credibility of the proposed methodology in terms of meeting specific market needs. Credibility and soundness of the Industrialization /Business Plan.
- 3.2. Quality and effectiveness of the work plan, including extent to which the resources assigned to work packages are in line with their objectives and deliverables: credibility and soundness of budget plan and schedule.
- 3.3. Capability to mobilize additional resources, internal and external to the proposal, for post-IIF implementation and project further follow up and development

Each of the subcriteria could be scored from 0 to 5, according to a scoring model that was including also an explanation, justification and personal motivation of the score assigned by each evaluator. The evaluation documentation with the scoring model was presented in a excel file, for an easy handling of the evaluators and harmonic elaboration of the result.

All the details concerning the IIF, the rules to respect, the timeline, the template of documentation requested and as well the Criteria of evaluation, have been publicly disclosed at the open link <https://ifast-project.eu/iif>.

## 3 Call for Proposal and evaluation results

### 3.1 FIRST ROUND OF EVALUATION

Immediately after the green light provided by the Governing Board in May 2022, the Call for Proposal was launched, with the objective to have awarded projects activities starting already at the beginning of 2023. A proper campaign of advertising and disclosing the CfP in the IFAST community and outside was set up and a web site was prepared to provide transparency to the process, fixing a precise timeline and detailed information to interested participants. On September 15<sup>th</sup>, the deadline for projects submission, 18 projects were presented for evaluation, with one that was considered not eligible by evaluators, because not respecting the requirements specified as mandatory in the call. In the table below is the details of the presented eligible projects:

Table 1

num	Project title – submitted on 15 <sup>th</sup> September	requested budget
#1	Superconducting opposite-field septum magnet prototype	<u>152.5</u>
#2	High-Temperature High-Gradient Superconductors (HIGHEST)	<u>160</u>
#3	Permanent magnet solenoid for High efficiency Klystron	<u>115.0</u>
#4	Development of highly efficient megawatt class cross field vacuum tube amplifier for particle accelerators driven by a solid-state power amplifier at 750 MHz	<u>200</u>
#5	inBEST	<u>129</u>
#6	BASE3	<u>200</u>
#7	MAGNETRONS	<u>150</u>
#8	KAIO-Accelerator	<u>200</u>
#9	High-quality Electron Accelerator driven by a Reliable Laser for Industrial uses (EARLI)	<u>200</u>
#10	Demonstration of additive manufacturing for large and complex shaped vacuum chambers by Plasma Metal Deposition (PMD®)	<u>100</u>
#11	AM applications of refractory metals for ION Sources	<u>100</u>
#12	Millisecond flash lamp treatment for SRF accelerating cavities	<u>160</u>

#13	UTMOST CLEEN Atmosphere: Ultra-Thin Membrane Overlay STacks to Channel Low Energy ElectroNs to Atmosphere	<u>not indicated / missing resource and budget</u>
#14	A Field Emission Cathode for a Travelling-Wave RF gun for High Brightness beams in Industrial and Small Research Facility Settings	<u>200</u>
#15	Software Defined Radio based custom signal analysis and generation tool	<u>200</u>
#16	Graphenic foil stripper for high intensity particle beams	<u>150</u>
#17	Electron guns for societal applications exploiting opportunities offered by additive manufacturing	<u>200</u>

EvB, in its 1<sup>st</sup> round of Evaluation, worked out, before an independent, and successively, a joint evaluation of the eligible proposals. Remote meetings were held and on Oct. 14th consensus was easily reached on the determination. In the graph below are reported the scores of the individual members of the EvB on each submitted project, showing a quite uniform judgment of the single projects, and also few deviations, reflecting specific personal considerations, as to be expected in similar cases.

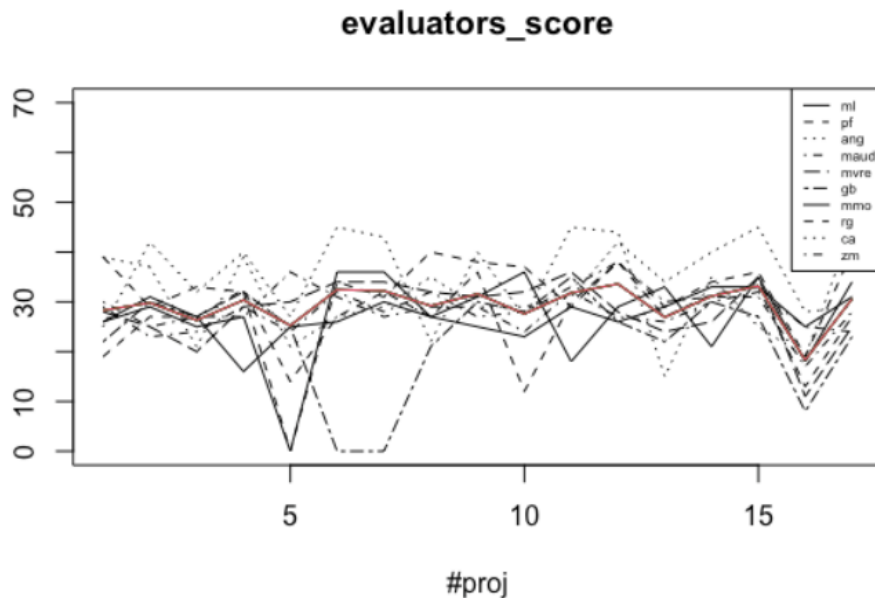


Figure 1



### 3.2 SECOND ROUND OF EVALUATION

The projects were eventually scored (see Table below) and according to their ranking, the first 10 projects were invited to present at CERN their proposals on November 2022. The projects were preventively informed about the technical and/or management aspects that EvB wished more in detail to address and to clarify during the meeting. Below is the table of the scored projects after 1<sup>st</sup> round of evaluation, with the first 10 scored projects that passed to a second round of evaluation. According to the ranking of projects in red are indicated the excluded projects.

Table 2

score	Project #	Project title
1	#3	Permanent magnet solenoid for High efficiency Klystron
2	#4	Development of highly efficient megawatt class cross field vacuum tube amplifier for particle accelerators driven by a solid-state power amplifier at 750 MHz
3	#6	BASE3
4	#8	KAIO-Accelerator
5	#2	High-Temperature High-Gradient Superconductors (HIGHEST)
6	#14	A Field Emission Cathode for a Travelling-Wave RF gun for High Brightness beams in Industrial and Small Research Facility Settings
7	#12	Millisecond flash lamp treatment for SRF accelerating cavities
8	#11	AM applications of refractory metals for ION Sources
9	#10	Demonstration of additive manufacturing for large and complex shaped vacuum chambers by Plasma Metal Deposition (PMDA®)
10	#16	Graphenic foil stripper for high intensity particle beams
11	#1	Superconducting opposite-field septum magnet prototype
12	#5	inBEST
13	#7	MAGNETRONS
14	#9	High-quality Electron Accelerator driven by a Reliable Laser for Industrial uses (EARLI)
15	#13	UTMOST CLEEN Atmosphere: Ultra-Thin Membrane Overlay STACKs to Channel Low Energy ElectroNs to Atmosphere

16	#15	Software Defined Radio based custom signal analysis and generation tool
17	#17	Electron guns for societal applications exploiting opportunities offered by additive manufacturing

After the 2<sup>nd</sup> round of evaluation, following the live presentations, EvB in a meeting held on Nov. 25<sup>th</sup>, proposes to GB, in its December session, to endorse the selection of the projects reported in the Table above, and to award funding to these.

In particular, the projects awarded are:

- Permanent magnet solenoid for High efficiency Klystron**  
 Scope of the project is to design and build a permanent magnet solenoid for an available klystron. By increasing efficiency of the klystrons, it promises to reduce the operational costs of any accelerator together with the associated carbon footprint. The involved institutes and industries are CERN and Elytt. The budget request is 115 KEur.
- High-Temperature High-Gradient Superconductors**  
 Scope of the project is to develop and optimize a 3D coating technology and demonstrate its scalability to make practical RF high power devices. It promises an improvement in Q factor resulting in relevant energy savings for accelerators. The involved institutes and industries are CERN, CSIC, CERACO. The budget request is 160 KEur.
- Field Emission Cathode for a Travelling-Wave RF gun for High Brightness Beams**  
 Scope of the project is to develop a versatile high brightness MeV electron source based on a field emission cathode. The field emission gun's overall footprint is expected smaller than compared to RF photogun and DC thermoionic gun. Consequently, it will have a reduced environmental impact. Involved institutes/industries are: PSI, VDL. The budget request is 200 KEur.
- KAIO Accelerator**  
 Scope of the project is to industrially develop a cost- efficient and stable high power laser technology in kHz class, apt to be used in radiobiology and NTD applications. It promises to reduce energy requirements for LPA. Involved institutes/industries are: CNRS, CNR. The budget request is 200 KEur.
- Development of Highly Efficient MW Class Cross Field Vacuum Tube Amplifier for Particle Accelerators Driven by a Solid State Power Amplifier at 750 MHz**  
 Scope of the project is to develop a megawatt class cross-field amplifier (CFA) based RF system for particle accelerator applications. It promises the realization of a CFA with peak RF power of 1 MW at 750 MHz with Efficiency >80%, Gain ~30dB, Duty cycle 0.1 % and PRF 1 kHz. . Involved institutes/industries are: Uppsala University. The budget request is 200 KEur.

- 6. Millisecond flash lamp treatment for SRF accelerating cavities**  
Scope of the project is to develop a novel thermal process to improve performances of SC coating by suppressing (reducing) Cu substrate heating. SC resonant cavities operating at higher T than bulk Nb promise to reducing cryogenic power costs by 60%. In addition, FLA is less energy-intensive (20-30) resulting in a reduction of CO2 emissions. Involved institutes/industries are: INFN, HZDR, Piccoli. The budget request is 160 KEur.
- 7. AM applications of refractory metals for ION Source cavities**  
Scope of the project is to develop new Refractory Metals Alloys specifically Designed for Additive Manufacturing to improve the physical performance of the ion sources (Ta-based and/or Nb- based alloys) or to solve the fabrication defects related to pure metals production. It promises to reduce amount of wasted material and increase process efficiency. Involved institutes/industries are: INFN, CNR. The budget request is 100 KEur.
- 8. Demonstration of additive manufacturing for large and complex shaped vacuum chambers by Plasma Metal Deposition (PMD®)**  
Scope of the project is to demonstrate the Plasma Metal Deposition (PMD) as AM of a large and complex vacuum chamber geometry. It promises a positive impact on the environmental footprint by reduction of material waste by 30 % and more, reduction of integration steps , reduction of stock material, reduction of lead time. Involved institutes/industries are: RHO, SBI. The budget request is 100 KEur.

The presentations that were made at CERN on Nov. 2022, and on which the EvB based the final scoring of the evaluation, are available at the indico agenda here below:

<https://indico.cern.ch/event/1210343/>

## 4 Governing Board required decision

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The selection operated by the EvB had to be endorsed by the GB, which had also to vote for the transfer of EC funding between Beneficiaries required for the execution of the Projects, considering that the IIF budget of 1 M€ was originally allocated to CERN as Coordinator and manager of the Fund. Agreement of the GB was also required to accept as new I.F.A.S.T. partner organisations the recipients of IIF funding that were not already part of the Consortium. In this way, they will be invited to sign the Consortium Agreement with the goal of defining all issues concerning IP and exchange of information with the partners.

The GB approval by electronic vote was granted on January 16th, 2023.

The following methodology was approved by GB to allocate the required resources to IIF projects:

- For the institutions that are already I.FAST Beneficiaries, the funds will be transferred as an increase of their EC contribution, correspondingly to their requested IIF budget, and claiming cost to EC together with other expenditures, following the usual rules.
- The institutions that are not I.FAST Beneficiaries, shall become Partner Organizations, and their IFF requested budget will come from a special CERN Grant.

Also, the GB, in its determination of Jan 16<sup>th</sup>, has approved the access of the following institutions as new Partner Organizations to I.FAST: CSIC (Sp), Ceraco (D), HZDR (D), SBI (At).

Following the GB approval, the new Partners shall sign the Accession Form (i.e. Consortium Agreement) and the Letter of Commitment to provide financial information according to the I.FAST rules. These Organizations are part of consortium among the following funded IFF projects: Highest, Msec flash, AM vacuum chamber.

## 5 Conclusion

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The selected projects have already started implementing their technical scope with a pre-financing of 50% of the requested budget that has been transferred by the coordinator in March 2023. The remaining 50% of the requested budget will be transferred upon submission of the technical reports that will happen a M35 (March 2024), providing evidences on progress in the first year / year and a half of the project, and at M47 (March 2025) to providing evidences of the final result and achievements of the projects.