

# I-FAST

Innovation Fostering in Accelerator Science and Technology  
Horizon 2020 Research Infrastructures GA n° 101004730

## DELIVERABLE REPORT

### Industry Workshop Report

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#### ABSTRACT

The organization of the Industry Workshop was one of the main activities planned for Task 1 of Work Package 3 - Industry Engagement. The original plan of holding one Industry Workshop mid-way through the project was expanded to enhance the opportunities for companies to meet the I.FAST community through the inclusion of a second Industry workshop held in April 2023 and a third one to be held before the end of the project.

It was also decided to schedule the workshops close to the I.FAST Annual meetings, thus offering companies the opportunity to attend both events.

This document describes the goals, the implementation, the conclusions and the follow-up of the two events.

IFAST 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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## **1. The Industry Workshops**

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The original plan, as described in the I.FAST proposal, was to organize an Industry Workshop halfway through the I.FAST project. However, for a number of reasons, in particular the strong interest in fostering co-innovation with industry, the original plan had to be expanded to provide more than a single opportunity for companies to meet the I.FAST community. It was therefore decided to organize a General Industry Workshop (GIW) at CERN on May 3-4, 2022 ("I.FAST Accelerator-Industry Co-Innovation Workshop") approximately one year after the start of the project, and then to plan further follow-up events in consultation with the I.FAST Industry Advisory Board (IAB).

At its meeting on May 2, 2022, the IAB suggested that subsequent Industry Workshops should focus on specific topics, and it was then proposed to organize a Thematic Industry Workshop (TIW) dedicated to HTS technologies in the following year, which was then held in Trieste on April 18, 2023 ("Industry Workshop on HTS developments and applications").

It was also decided to schedule the workshops in conjunction with the I.FAST annual meetings. This decision made the organization more complex, but greatly increased the opportunities for companies to get in touch with I.FAST activities and to interact with the I.FAST community.

## 2. The General Industry Workshop

### 2.1 GOALS OF THE GIW

A Program Committee was formed in January 2022, (see composition in Appendix I), consisting of 14 people from 7 different European countries, with representatives from the European Industry, Research Institutions, the Forum of the CERN Industrial Liaison Officers and the I.FAST Work Packages 3 and 4. It was thus intended from the outset to set up the workshop as an opportunity to foster collaboration and allow all parties involved to make their voices heard so as to maximize involvement and interest in the event.

The main goals of the GIW, as established by the Program Committee in the first meeting held on January 27th, 2022, were the following:

- provide an overview of the major project developments with accelerators, both in Research Institutions worldwide, as well as in specific application fields (e.g. medical sector);
- make the European Industry at large aware of the specific developments in Accelerator-related technology being pursued in I.FAST;
- provide information on opportunities of industry engagement in I.FAST;
- discuss how to develop further and consolidate the co-innovation model.

The Program Committee was convened two more times in February and once in March, finalizing the agenda and making a careful choice of the speakers (see Appendix II and the WS web site <https://indico.cern.ch/event/1138690/> )

### 2.2 STRUCTURE OF THE WORKSHOP

The first day of the GIW was dedicated to the exploring and discussing three main topics:

- the technical challenges driving the current cutting-edge accelerator R&D programs and the opportunities for co-innovation with industry;
- the pursuit of sustainability as a stimulus for innovation in the design, construction and operation of accelerators;



- experiences, results and outlooks on co-innovation initiatives as seen from different perspectives:
  - participation of companies in R&D programs as technology innovators,
  - the European Commission support for co-innovation in accelerator R&D,
  - Industry's point of view on the opportunities and challenges of co-innovation;

The second day of the GIW was embedded in the program of the I.FAST Annual Meeting and was aimed to illustrate the different ways in which I.FAST implements the co-innovation concept. The agenda of the meeting was therefore organized as follows:

- general presentations in the morning, including those outlining opportunities open to companies not yet involved in I.FAST, i.e.:
  - the Internal Innovation Fund: a competitive call for innovation-oriented projects to be proposed in collaboration with industry,
  - the Traineeship Program for industrial staff at the European Accelerator Laboratories;
- reports on a selection of innovative developments being carried out by some of the I.FAST Work Packages, in the afternoon.

## 2.3 PARTICIPATION AND MAIN OUTCOME OF THE GIW

The GIW was advertised not only within the I.FAST community, but also to the European Industry at large, thanks to the collaboration of the CERN Industrial Liaison Officers.

The level of participation was very good, especially from the nearly 80 industry representatives who attended, representing the majority of the participants.

During the final panel round table, a fruitful and open discussion took place between Research Infrastructures and Industry representatives resulting in a common recognition of the need to:

- extend collaboration with Industry to the early stages when programs, roadmaps and initiatives of common interest are defined, analyzed and prioritized;
- overcome the possible limitations and shortcomings in exploiting the full potential of collaboration, especially in the first phases of the R&D work, with the necessary commitment and continuity.

A proposal emerged to move forward in the agreed direction by creating a permanent Industry - Accelerator Research Industry Forum. This idea was then endorsed by the I.FAST Steering Committee and by the Tiara Consortium in the following months and was finally implemented in the first half of 2023.

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## 3. The Thematic Industry Workshop (TIW)

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### 3.1 GOALS FOR THE TIW

The main objective of the TIW was to provide an opportunity to bring together industry representatives and experts from the accelerator community to explore the challenges and opportunities for strengthening the cooperation with industry in Europe in the coming years in the field of High Temperature Superconductors (HTS) developments.

Recent developments have shown impressive progress due in particular to applications in the field of nuclear fusion applications and the potential for exploitation in the next generation of accelerators looks very promising. The workshop was also intended to discuss the possibilities of developing initiatives that can make this cooperation with the European Industry most successful with fallout beneficial effects for the accelerator community and for our society as a whole.

The Program Committee was established in January 2023 and included three renowned experts in the topic to which the workshop was devoted, one from industry and two from research institutes, the project coordinator and the coordinator of Work Package 3.

### 3.2 STRUCTURE OF THE WORKSHOP

In addition to providing a series of initial presentations, with which to take stock of the most relevant R&D activities in the field of accelerators and superconducting magnets and in other related sectors, the Program Committee identified a series of contributions to stimulate the discussion to be included on the agenda on the following topics:

- the need for new and expensive facilities in Europe: the characterization of HTS materials will indeed require ultra-high field test stations (30 to 40 T, accessible for a significant period of time), variable temperature setups, electro-mechanical testing in non-standard configurations, etc.;
- the difficulties that European companies may face in entering the HTS market;
- the opportunities to make participation in HTS application development programs sponsored by European Research Institutions more effective and attractive to companies.
- the potential of possible initiatives at the European level which may be represent the only option to secure the necessary funding needed to implement a large-scale aggressive program that can benefit European companies.

The agenda of the TIW is reported in Appendix III and in the web site <https://indico.cern.ch/event/1264051/>.

### 3.3 MAIN OUTCOME

The Workshop was attended by more than 50 participants from academia and European companies (Figure 1).

The final discussion made it possible, in particular, to collect feedback from the industry representatives attending the workshop on two proposed initiatives related to HTS developments, namely:

- the submission of a proposal to the HORIZON-INFRA-2024-TECH-01-01 call whose main goal is to deliver innovative scientific instruments, tools, methods and solutions which will advance the state-of-art in Research Infrastructures, thus meeting the ambitions of the accelerator community to exploit the opportunities offered by the HTS technologies;
- the participation in a Superconductivity Global Alliance to develop and endorse a strategic roadmap for superconducting solutions and commercial products, including a concise list of grand challenges where SC can make a step change and significant impact towards a greener, healthier, more prosperous, and sustainable future.

The general attitude expressed by the participants was positive about both initiatives. In particular, it was emphasized that the proposal to develop a project for submission to the HORIZON-INFRA-2024-TECH-01-01 call should certainly be pursued, as this is a time when a strong and fruitful synergy can be realized between the developments in HTS that are taking place in different areas. The second initiative seemed very ambitious, and the conclusion of the ongoing work on the "White Paper on grand challenges", which is expected in the summer, will be a key step to then assess what involvement could be established with Research Institutions and companies involved in R&D on accelerators.



*Figure 1: Attendance to the TIW at Trieste (April 2023)*

## Annex: Glossary

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<b>Acronym</b>	<b>Definition</b>
IAB	Industry Advisory Board
HTS	High Temperature Superconductors
GIW	General Industry Workshop
TIW	Thematic Industry Workshop

## Appendix I

# Composition of the Program Committee for the General Industry Workshop

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Name	Institution/Company	Country
Jim Clarke	STFC	UK
Angeles Faus-Golf	IJCLAB	FR
Erik Fernandez	INEUSTAR	ES
Friedrich Haug	CERN	DE
Michel Hubner	EPFL	CH
Marcello Losasso	CERN	IT
Jean Luc Lancelot	Sigmaphi	FR
Ziad Melhem	Oxford Quantum Solutions	UK
Mauro Morandin	INFN-PD	IT
Manuel Moreno Ballesteros	CDTI	ES
Jose Manuel Perez Morales	CIEMAT	ES
Djamschid Safi	DESY	DE
Marco Statera	INFN-MI	IT
Jan Visser	NIKHEF	NL

## Appendix II

### GIW Program

#### GIW, MAY 3, 2022 - MORNING SESSION

09:00	<b>Welcome address</b> <div style="text-align: right;">09:00 - 09:10</div>
	<b>Future HEP projects and R&amp;D roadmap</b> <i>Mr Tor Raubenheimer</i>  <div style="text-align: right;">09:10 - 09:30</div>
	<b>Super and normal conducting Radio Frequency Structures</b> <i>Mr Frank Gerick</i>  <div style="text-align: right;">09:30 - 09:50</div>
10:00	<b>High-Field Magnets including HTS</b> <i>Amalia Ballarino</i>  <div style="text-align: right;">09:50 - 10:10</div>
	<b>Ion and proton sources</b> <i>Santo Gammino</i>  <div style="text-align: right;">10:10 - 10:30</div>
	<b>RF Solid state amplifiers</b> <i>Eric Montesinos</i>  <div style="text-align: right;">10:30 - 10:45</div>
	<b>Coffee Break</b> <div style="text-align: right;">10:45 - 11:05</div>
11:00	<b>High efficiency klystrons</b> <i>Igor Syratchev</i>  <div style="text-align: right;">11:05 - 11:20</div>
	<b>Laser technologies for particle acceleration</b> <i>Leonida Antonio (Leo) Gizzi</i>  <div style="text-align: right;">11:20 - 11:40</div>
	<b>Hi-Tech Components for Synchrotron Radiation upgrades</b> <i>Mr Riccardo Bartolini</i>  <div style="text-align: right;">11:40 - 12:00</div>
12:00	<b>Accelerators Health Applications</b> <i>Elena Benedetto</i>  <div style="text-align: right;">12:00 - 12:20</div>
	<b>Accelerators Environmental and Industrial Applications</b> <i>Frank-Holm Roegner</i>  <div style="text-align: right;">12:20 - 12:40</div>
13:00	<b>Panel discussion</b> <i>Angeles Faus-Golfe</i> <div style="text-align: right;">12:40 - 13:30</div>

## GIW, MAY 3, 2022 - AFTERNOON SESSION

14:00	<b>Lunch Break</b>		13:30 - 14:30
	<b>Technologies for Sustainable Accelerators</b>	Mike Seidel 	14:30 - 14:50
15:00	<b>Towards Environmentally Responsible Procurement Policies (online)</b>	Enrico Cennini 	14:50 - 15:05
	<b>Advanced HTS tape for high-field applications</b>	Sara Landvogt et al. 	15:05 - 15:20
	<b>Robotic thehnology for accelerators: current applications and future outlook</b>	Ekkehard Zwicker et al. 	15:20 - 15:35
	<b>EC support for co-innovation in accelerator R&amp;D programs: experience and perspective</b>	Patricia Postigo McLaughlin 	15:35 - 15:50
16:00	<b>Co-innovation in I.FAST and beyond: the vision of an industrial partner</b>	Raffaella Geometrante 	15:50 - 16:05
	<b>Spreading technology innovation from accelerators developments to other industrial domains: the role of industry.</b> Hans Priem		
	<b>The role of pre-commercial procurement in co-innovation: lesson learnt and future perspectives</b>	Julio Lucas 	16:20 - 16:35
	<b>Coffee Break</b>		16:35 - 16:55
17:00	<b>Contribution to Accelerator Science and Technology. A vision from the industry</b>	Miguel Carrera 	16:55 - 17:10
	<b>Extending the industrial involvement of companies in accelerator-related R&amp;D activities</b>	Erik Fernández 	17:10 - 17:30
	<b>Round table discussion</b>	Company & RI Representatives	17:30 - 17:55

## GIW / I.FAST A.M., MAY 4, 2022 - MORNING SESSION

09:00	<b>Welcoming address</b> <i>80/1-001 - Globe of Science and Innovation - 1st Floor, CERN</i>	<i>Mike Lamont</i> 09:00 - 09:05
	<b>Introduction by the Project Coordinator</b> <i>80/1-001 - Globe of Science and Innovation - 1st Floor, CERN</i>	<i>Maurizio Vretenar</i>  09:05 - 09:20
	<b>Presentation of the Scientific Advisory Board Committee</b> <i>80/1-001 - Globe of Science and Innovation - 1st Floor, CERN</i>	<i>Akira Yamamoto et al.</i> 09:20 - 09:30
	<b>Presentation of the Industry Advisory Board</b> <i>80/1-001 - Globe of Science and Innovation - 1st Floor, CERN</i>	<i>Angeles Faus-Golfe</i>  09:30 - 09:40
	<b>The I.FAST Innovation Fund</b> <i>80/1-001 - Globe of Science and Innovation - 1st Floor, CERN</i>	<i>Marcello Losasso</i>  09:40 - 10:00
10:00	<b>Industrial Training associated with knowledge transfer</b> <i>80/1-001 - Globe of Science and Innovation - 1st Floor, CERN</i>	<i>Tord Johan Carl Ekelof</i>  10:00 - 10:10
	<b>The I.FAST Challenge Based Innovation (online)</b> <i>80/1-001 - Globe of Science and Innovation - 1st Floor, CERN</i>	<i>Nicolas Delerue</i>  10:10 - 10:30
	<b>Coffee Break</b> <i>80/1-001 - Globe of Science and Innovation - 1st Floor, CERN</i>	10:30 - 11:00
11:00	<b>The I.FAST Innovation potential</b> <i>80/1-001 - Globe of Science and Innovation - 1st Floor, CERN</i>	<i>Djamschid Safi</i>  11:00 - 11:15
	<b>Development of the European Technology Infrastructure</b> <i>80/1-001 - Globe of Science and Innovation - 1st Floor, CERN</i>	<i>Sylvie Leray</i>  11:15 - 11:40
	<b>New RF Amplifiers based on GaN Semiconductors</b> <i>80/1-001 - Globe of Science and Innovation - 1st Floor, CERN</i>	<i>Dragos Dancila</i>  11:40 - 11:55
12:00	<b>Sustainable Concepts and Technologies</b> <i>80/1-001 - Globe of Science and Innovation - 1st Floor, CERN</i>	<i>Mike Seidel</i>  11:55 - 12:10
	<b>High Efficiency Klystron Prototype</b> <i>80/1-001 - Globe of Science and Innovation - 1st Floor, CERN</i>	<i>Olivier Brunner</i>  12:10 - 12:25
	<b>Permanent Magnet Quadrupoles</b> <i>80/1-001 - Globe of Science and Innovation - 1st Floor, CERN</i>	<i>Ben Shepherd</i>  12:25 - 12:40

## GIW / I.FAST A.M., MAY 4, 2022 - AFTERNOON SESSION

3:00	<b>Lunch Break</b>	
	80/1-001 - Globe of Science and Innovation - 1st Floor, CERN	12:40 - 14:00
4:00	<b>Carbide-carbon materials for multipurpose applications</b>	Federico Carra 
	80/1-001 - Globe of Science and Innovation - 1st Floor, CERN	14:00 - 14:15
	<b>Innovative Superconducting Magnets</b>	Lucio Rossi 
	80/1-001 - Globe of Science and Innovation - 1st Floor, CERN	14:15 - 14:45
	<b>Development of ReBCO HTS nucletron cable</b>	Tiemo Winkler 
	80/1-001 - Globe of Science and Innovation - 1st Floor, CERN	14:45 - 15:00
5:00	<b>Strategy for Implementing new Societal Applications</b>	Andrea Sagatova 
	80/1-001 - Globe of Science and Innovation - 1st Floor, CERN	15:00 - 15:15
	<b>Design of Advanced Electron Accelerator Plant for Biohazard Treatment</b>	A.Chmielewski@ichtj.waw.pl Chmielewski 
	80/1-001 - Globe of Science and Innovation - 1st Floor, CERN	15:15 - 15:30
	<b>Internal RF Ion Source for Cyclotrons</b>	Daniel Gavela Perez 
	80/1-001 - Globe of Science and Innovation - 1st Floor, CERN	15:30 - 15:45
6:00	<b>Coffee Break</b>	
	80/1-001 - Globe of Science and Innovation - 1st Floor, CERN	15:45 - 16:15
	<b>Additive manufacturing - plans and recent results</b>	Andris Ratkus et al. 
	80/1-001 - Globe of Science and Innovation - 1st Floor, CERN	16:15 - 16:35
	<b>Machine Learning techniques for accelerator and target diagnostics (online)</b>	Irena Dolenc Kittelmann et al. 
	80/1-001 - Globe of Science and Innovation - 1st Floor, CERN	16:35 - 16:50
7:00	<b>AM manufacturing of Superconducting cavities</b>	Adriano Pepato 
	80/1-001 - Globe of Science and Innovation - 1st Floor, CERN	16:50 - 17:05
	<b>Development of electro-optical waveguide sensors</b>	Stephen Gibson 
	80/1-001 - Globe of Science and Innovation - 1st Floor, CERN	17:05 - 17:20

# Appendix III

## TIW Program - April 18, 2023

14:00	→ 14:05	<b>Introduction</b>	Speaker: Mauro Morandini (Universita e INFN, Padova (IT))
14:05	→ 15:53	<b>Session 1: Overview of the cutting-edge ongoing and planned R&amp;D efforts</b>	Convener: Ziad Melhem
14:05		<b>Status and perspectives of R&amp;D on HTS tapes</b>	Speaker: Alexander Molodyk (Faraday Factory Japan) 2022-04 FFJ IFAST.p...
14:23		<b>R&amp;D in MgB2 wires and related applications</b>	Speaker: Giovanni Grasso ASG_MgB2_R_D.pdf
14:41		<b>HTS R&amp;D for applications in the energy storage sector</b>	Speaker: Luis Garcia-Tabares HTS APPLICATIONS...
14:59		<b>R&amp;D for HTS and MgB2 Superconducting magnets for beam lines, ion gantries and the IRIS research infrastructure</b>	Speaker: Stefano Sorti R&D for HTS and M...
15:17		<b>Exploring HTS technologies for next generation airliners: the ASCEND program at Airbus</b>	Speaker: Souhaib Boukayoua (Airbus) ASCEND for IFAST ...
15:35		<b>HTS R&amp;D for RF cavities</b>	Speaker: Cristian Pira IFAST 2023-HTS R&...
15:55	→ 17:44	<b>Session 2: Opportunities and challenges for the involvement of European Industry in HTS developments</b>	Convener: Jose M Perez (CIEMAT)
15:55		<b>HTS for the future of HEP - Accelerator Opportunities and Infrastructures Required</b>	Speaker: Luca Bottura (CERN) 20230418 IFAST.pdf
16:20		Coffee Break	
16:50		<b>Lesson learnt from the Eco Swing Project</b>	Speaker: Dr Marc Dhallé (University of Twente) 2023 ifast worksho...
17:08		<b>Fostering public-private R&amp;D cooperation in HTS developments</b>	Speaker: Antonio Pellicchia (ASG Superconductors) ASG-IFAST Fosterin...
17:26		<b>Entering the HTS market</b>	Speaker: Mr Aitor Echeandia
17:45	→ 18:15	<b>Session 3: Opportunities at European level</b>	Convener: Dr Sylvie Leray
17:45		<b>Exploiting the INFRATECH calls</b>	Speaker: Maurizio Vretenar (CERN) EUcalls_IFAST_indu...
17:55		<b>SC Global Alliance Initiative (ScGA)</b>	Speaker: Ziad Melhem 2023-04-18 ScGA O...
18:15	→ 19:00	<b>Panel discussion on exploitation of opportunities a European level, both short and longer term</b>	Speaker: Mauro Morandini (Universita e INFN, Padova (IT))