Extending the industrial involvement of companies in accelerator-related R&D activities

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IFAST, WP3.3.
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Outline

1. Description of the work

1. Motivation of IFAST WP.3.3.
2. Target industry profile
3. Format of contacts

2. Feedback

1. The global opinion of the industry on a deeper involvement on Low TRL
2. The case of not working at low TRL
3. The ideal industry-research labs interaction model within the ASc&T sector
4. About tendering and partnership tools to promote low TRL

3. Preliminary analysis and future actions

1. Advancing towards low TRL programs in ASc&T. Considerations
2. Preliminary outcome
3. Next actions

1.1. Motivation of IFAST WP.3.3.

The Industry on ASc&T research field

Within the community of Accelerator Science and Technology (ASc&T), a continuous and increasing involvement of the industry has been a priority:

- Fluent contacts and actions have been set out within previous projects between research institutions and industry (ARIES, FUSUMATECH, IFAST, HITRI+, ...)
- Similar approaches conducted from our Research and Technological Infrastructures (AMICI)

Feedback in previous accelerator projects:

- perceived unexploited potential contribution that industry could provide in R&D activities if engaged earlier in the process and (or) at low TRL research activities.

IFAST WP3.3 addresses this point:
Would it be benefitial an early involvement of the industry within the accelerator research and development activities?

Our role is analyze this question and, if so, understand how to facilitate an early engement of the industry in the ASc&T R&I activity

1.2. Target industry profile

Initial proposal:

focus on the IFAST partners industry

Reconsideration:

focusing on companies related to ASc&T R&I

Not limited to that.

Extend the contacts to the Industry of Science, ASc&T R&I, with links with other fields and sectors.

ACCELERATOR R&D. COMPONENTS
Sources and Injectors
RF structures
RF systems
SC magnets
Conventional NC magnet systems
Diagnostics and instrumentation
Targetry
Radiation issues
ACCELERATOR TECHNOLOGIES
Electronics and Software
UHV
RF sources
Cryogenics
Alignment and Stabilization

IFAST: Innovation Fostering in Accelerator Science and Technology

- Developing technologies for the next generation of particle accelerators:
  - 48 beneficiaries from 15 European Countries
  - 8 large RI operators,
  - 12 national research centers,
  - 12 universities,
  - **16 industrial partners** (1/3, including 11 SMEs) from 9 European Countries
- Timeline: 4 years, started on May 1 2021.
- Resources: 10 M€ EC contribution, out of a total project cost of about 19 M€.

iFAST

M. Morandin - 20 Jan. 2022

Particle accelerator community entering the age of open innovation nd creation of an innovation ecosystem

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

I.FAST is including for the first time in Accelerator related projects a large industry representation (1/3 of participants!)

Related fields	Conctact body
Particle Physics	ECFA
Nuclear physics	NuPECC
Light sources and FELs	LEAPS
Neutron sources	LENS
Medical applications	ENLIGHT, PTCOG
ADSR (nuclear reactors)	(MYRRHA)
Fusion energy	F4E, EUROFusion

1.3. Format of contacts

A generic questionaire is not advisable for this work

The specificity of the question **recommended face-to-face contacts with the companies**.

Thanks to the support of ILOs of different countries, we managed to set out interviews with a list of companies, holding conversation of one hour.

	Company	Contact	Meeting status	
France	**ILO**	**Nicolas Breton**	**24/2/22**	**09:30**
	SEF-Technologies	Eric Fanio	9/3/22	09:30
	SODITECH	Adrien Deverre	18/3/22	17:00
Netherlands	**ILO**	**Jan Visser**	**4/3/22**	**13:00**
	CRYOWORLD	Marcel K[illegible]	21/3/[illegible]	[illegible]
Italy	**ILO**	**Mauro Morandin**	**18/2/22**	**15:30**
	OCEM Power Electronics	[illegible]	3/[illegible]	[illegible]
	CAEN	Ferdinando Giordano	3/3/22	12:00
	ASG	Antonio Pellecchia	22/3/22	14:00
	SAES	Paolo Manini	9/3/22	16:00
	KYMA	Rafaella Geometrante	28/6/21	15:00
Germany	**ILO**	**Friedrich Haug**	**2/3/22**	**16:00**
	Billfinger Noell	Michael Gehring	1/7/21	13:30
	Trumpf	Marcus Lau	21/4/22	
	Bevatech	Holger Höltermann		
	Research Instruments	Michael Pekeler	21/4/22	
Spain	**ILO**	**Manuel Moreno**		
	AVS	M. Angel Carrera	20/10/21	15:00
	ELYTT	Aitor Echandía	8/10/21	09:00
	BTESA	Juan Lluch	2/6/21	09:15
Sweden	**ILO**	**Fredrik Engelmark**	**27/4/22**	**13:3**
	Qamcom	Otto Lilja	5/5/22	13:00
	Scandinova Systems	Mikael Lindholm		
Denmark	**ILO**	**Jonas Okkels Birk**	**8/4/22**	**14:00**
	Mark-wedell	Torven Ekval	21/4/22	10:00

A big thank to ILOs. Without their help, our work had not been possible

Coils, conventional magnets
Superconducting magnets
Scientific instrumentation
Undulators
LINACS
RFQ, cavities
RF amplifliers
Power electronics
Nuclear Electrinics
Precision Mechanics
Advanced Mechatronics

Particle Physics
Nuclear Physics
Nuclear
Neutron sources
Synchrotrons
XFELs

Astrophysics
Astronomy
Fusion
Space
Health

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2.1. The global opinion on a deeper involvement on Low TRL

Facts affecting the analysis

- A very heterogeneous community. We have not to expect a unified message from the industrial community.
- Very different level of knowledge of the field: some companies are just informed via closer institutions, others invest a bigger efforts on information.

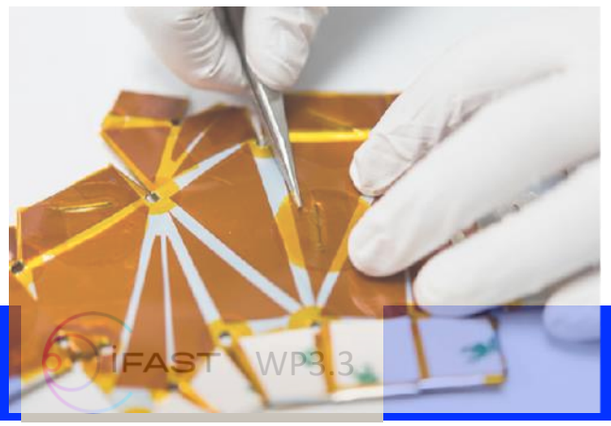
Opinion on low TRL

By vast majority, the interviewed companies are in strong favor of being involved at low TRL. They think that it is beneficial for both sides.

Only a small proportion, all of them smaller industries, limit this interest specifically to some aspects of their work, mainly due to lack of resource (limitation of risk).

We have identified a number of companies with long experience really critic with current situations, strongly claiming for a different approach ...

closer to ***previous industry-research institutions early contacts***.



2.2. The case of not working at low TRL

Some relevant companies declare cases in which the research institutions in the ASc&T field keep the policy of covering by themselves the first stages of the technological research, developing its own first prototypes. When this is the case:

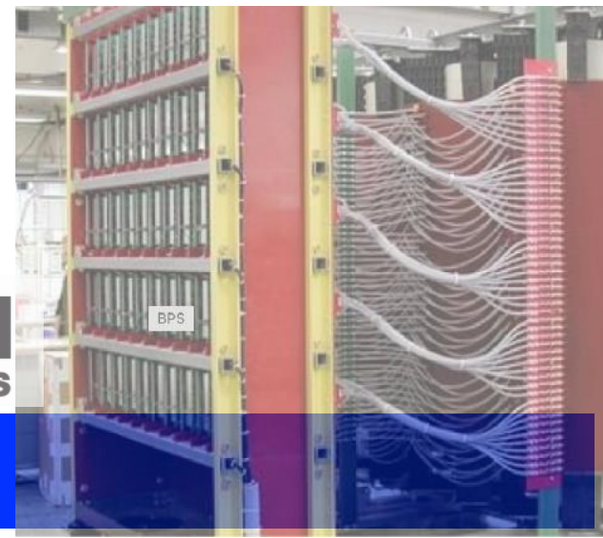
- **The result is not optimum from the final technical outcome viewpoint**: industry claims that prototypes developed in this format, in many cases, are subject to foregoing improvements.
- Procurements based on prototypes developed by the research institutions alone are **subject to limitations that can affect the contract development itself**: Modification of specifications, longer delivery terms and larger costs.
- The previous point can also have **implication on the tendering evaluation process**. Should the tendering companies have to raise the quoted prices for contingencies at the risk of losing the tender?
- It has been **reported conflict of interest of the industry involved in a collaboration role before placing the contract**. Providing support to the research institutions at early stages was considered as a non-equity advantage for applying to the tender.
- Early engagement is good for an adequate IP management. **The IP generation, when engaged at high TRL models, is managed under heterogenous modes and, in general, is not ideal to the industry.**

2.3. The ideal industry-research labs interaction model within ASc&T

From the feedback of the industries, we identify that, in the fields in which the research institutions could work with industry at low TRL and the institution decide not to do it, somehow, the research institution becomes a competitor of the industry**. The procurer can become a competitor**

If going to a higher level of integration of the industry at low TRL, the model demanded by the most experienced industry would suit the following points:

- Involve the company from the design stage.
- Separate the design stage from the production stage.
- Pursue well defined research and development programs, with integrated aims and long term.
- The good relationship with research institutions is considered as a strong added value. A work program based on the trust, on solid relations, is a solid guarantee for success. This simplifies tremendously the IP concerns.
- Support for training of young expert engineers and scientists. Sharing training personnel between research institutions and industry. Sharing the costs
- A strategy coordinated with the industry: the objectives defined according with **the resources of the research institutions and the resources and capability of the industry, put in common**. The **growing plan defined together**. Joining strategies.



2.4. About tendering and partnership tools to promote low TRL

Successful procurement models

Most of the companies are familiar only with standard procurement models.

Among the alternative options discussed on procurements, only innovative procurements such as PCP are mentioned as a model well suited to work at low TRL.

Important: not wide information about innovation procurements evidenced.

More advanced models in other fields

Examples of tendering processes of interest to low TRL have been found in other fields.

In Space applications, ESA has specific programs for low TRL: it is the case of the former TRP, currently TDE (Technology Development Element).

We want to highlight that ESA has set out procurement procedures flexible enough to be adapted to modifications during the procurement phase. CCN (Contract Change Notice, ESA own regulation as International Organization): sometimes, motivated by ESA, sometimes, requested by industry.

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3.1. Advancing towards low TRL programs in ASc&T. Considerations

Very difficult questions come up:

deploying a program based on the recommendations provided: can represent an actual outsourcing of know-how and own technology from the public institutions?
(not a trivial question, somehow sensitive)

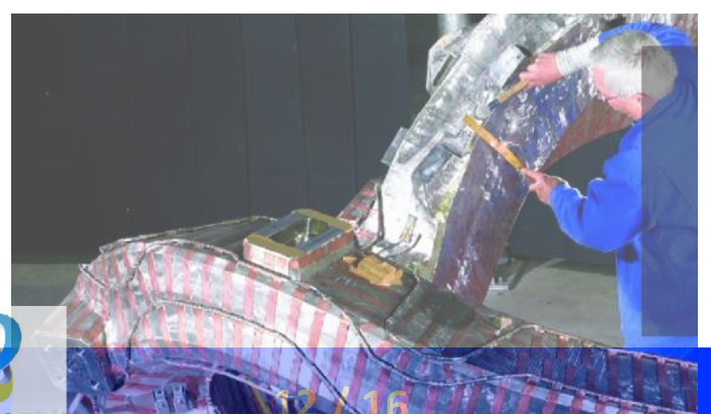
At the end, would it be a positive strategy?

We are not in position to answer this point, because of the difficulties of completing an ideal accompanying strategy of the industry to our programs.

We emphasize that the industrial collaboration in our field is bound to the following variables:

1. The specificity of ASc&T field. A reduced sector, in terms of industrial mass.
2. Short-term programs. Difficult to adapt to the strategies of the companies.
3. Regarding purchasing rules and procedure contracts, we are an atomized community.

Just preliminary considerations



3.2. Preliminary outcome

If we really want to engage into an industry-research instutes early stage model, actions might be taken both from the institutions and companies.

Preliminary messages to research institutions

- Leverage our internal technological capacity in line with the existing industry.
- Insisting on promoting E&T programs, making them visible to industry with lower experience and contacts via ILO.
- Assuring long-term development plans
- Related to the previous point: promote the integration of the information on new initiatives, calls, projects, infrastructure upgrades, etc.
- Promote the integration of roadmaps with other synergic fields. In particular, Fusion and Space, that might help to avoid peak-valley activity gaps.
- In this sense of the previous point, standarization of the tenders within Big Science is demanded.
- Work with the funding agencies to open new innovative procurement processes, more flexible to changes and contingencies. Relevant examples in other fields.

weakness: very challenging messages

3.2. Preliminary outcome

If we really want to engage into an industry-research instutes early stage model, actions might be taken both from the institutions and companies.

Preliminary messages to the industry

- A major effort on self-organization. Industry associations must be encouraged.
- Being proactive in the information about projects and tenders. Via conferences, sharing research projects, in particular the transversal work packages of integration projects, or via ILOs, among others.
- Help to co-fund the needed investment, at a fair balance, depending on the distance to the market.
- Proactivity on Education and Training Programs (interchanges, industrial PhD programs, ...)
- Further resources for earlier stages, to orientate the vision of development with higher market impact, when feasible.
- Be ready to share risk,
- Simplify and speed-up the internal communication process and the flux of information (catalogs, list of contacts, ...)

3.3. Next actions

Before final compilation, pending:

1. Completing the first iteration of the contacts (few companies pending)
2. Second iteration with selected companies and ILOs
3. Iteration with Research and Technological Institutions
4. Contacts with related fields

		2021				2022						2023						2024	
		May	July	Sept	Nov	Jan	March	May	July	Sept	Nov	Jan	March	May	July	Sept	Nov	Jan	March
		Year 1						Year 2						Year 3					
		M0	M2	M4	M8	M10	M12	M14	M16	M18	M20	M22	M24	M26	M28	M30	M32	M34	M36
Step 1	Background. Previous information of interest																		
	Private iteration with related industries. Preliminary feedback.																		
	Inform WP leaders and Project leader for an eventual help																		
Step 2	Internal iteration																		
	Definition of key questions																		
	Definition of IFAST companies, and TI, RI, others																		
Step 3	Define the contact network (under iterative basis)																		
	B2B meetings with companies in IFAST																		
	Workshops programmed in IFAST						Ind Ev			WP13??									
Step 4	Second iteration with selected companies																		
	Iteration with TI, RI																		
	Discussion with representative parties (Industry, ILO, RI/TI)																		
	Deliverable D3.1. drafting																		

Thank you very much!