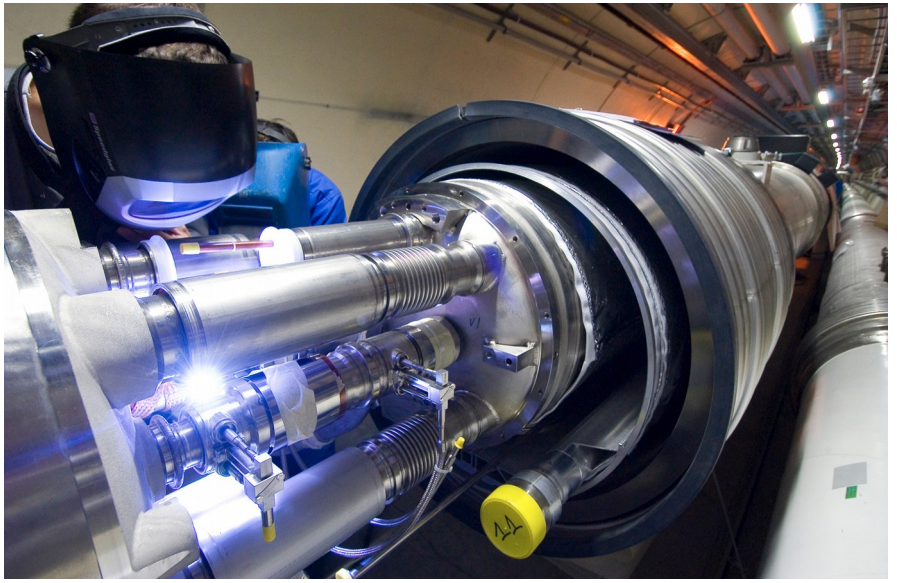

Interaction with Industry in AMICI

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Introduction

- relationship with industry has played **a central role** in AMICI
  - we started with an Industry forum and we finished with a second one
- why is it so important ?
- the direct interaction with technical platforms open up **new opportunities** of collaboration for industry that go beyond the usual relationships well established by the RI
  - based essentially on **procurement**, specific **technology transfer initiatives** and **access to the research facilities** (e.g. beam lines in light sources)

  AMICI has explored several of these opportunities in WP4 and WP5 obtaining eventually a good understanding of where the possible mutual benefits are, as well as the difficulties
- besides, exploitation of TI by industry was expected to play a role in **making the European TI more sustainable**
- eventually one should aim at integrating the TP existing in labs, funded with public money, with TPs that exist by private companies into a **single common European TI**

On sustainabilty

- We have carried out an analysis to **better characterize the impact on sustainability**
- and, as a by-product,
  - to identify the **best practices**,
  - to clarify the **impediments and limiting factors**
  - to **suggest possible improving actions**
- examining in detail a few real cases from three Research Institutions **(CEA, DESY and Elettra**), with the first two directly involved as partners in AMICI.
- The analysis clearly shows that the real possibilities of exploiting the TPs **vary quite significantly** on a case by case basis
- The impact of services provided to third parties can be classified in two categories:
  - **direct impact** in terms of activities with for industry that, complementing the ones originated from the institutional commitments, may help in providing continuity, partial support for personnel during periods of reduced activity, funds for upgrading and maintaining the facilities;
  - **indirect impact** which are not directly bringing additional financial resources but that may be quite important to secure the **support of national/regional/local communities** and the chances to **preserve competences and personnel motivations**

The DESY Technical Platforms

- The following major Technical Platforms (TPs) at DESY have been included in the AMICI web site dedicated page:
  - TP1 - Laboratory for the **detailed examination of large series of niobium sheets** for the production of superconducting cavities
  - TP2 - Metallurgy laboratory for the **examination of material needed for the production of superconducting cavities**.
  - TP3 - Dedicated infrastructure for the preparation of superconducting cavities including **800°C and 1400°C baking, chemistry for surface treatment (BCP and electro-polishing), high pressure water rinsing, CO2 cleaning with dry ice, large ISO4 clean rooms**.
  - TP4 - Several vertical test stands for the **characterization of superconducting accelerator cavities**
  - TP5 - Dedicated assembly infrastructure for the first **assembly / for dis-assembly and repair of superconducting accelerator modules.**
  - TP6 - Preparation and assembly of **particle clean vacuum systems**.
  - TP7 - Several horizontal test stands for the **characterization of completely assembled superconducting accelerator modules**.
  - TP8 - Test stand for the characterization of smaller **superconducting quadrupole magnets**.

The DESY Technical Platforms (II)

- These TPs were originally been setup for the construction and maintenance of the **XFEL Superconducting RF Cavities (SRFC) and accelerator modules**
  - subsequently exploited for **other accelerators projects.**
- in addition there are other TPs at DESY deal with different technologies developed for accelerators, e.g.:
  - TPs for **klystrons and modulators**
  - **µTCA lab**
    - **most successful example** of TP wth high impact for external projects
    - originally set up for developing the electronics boards used in the XFEL control system.
    - has evolved now into an independent spin-off initiative whose activities are now to a large extent supported by **revenues obtained from services provided to external parties**
    - the lab regularly organizes industrial events that attract large industrial worldwide participation.

DESY – Services provided

- TP1 to TP4 have provided services to third parties customers, private companies and a handful of Institutes, in the last ten years:
  - approximately **20 cases** have been handled, half of them involving TP4; the largest contracts were related to TP1.
- In most cases, **products and tests** have been carried out for third parties, but TPs competences have also been exploited for **consultancy and training**.
  - The latter took place at both, DESY and at partner labs and companies.

DESY – The impact

- The impact of activities related to service provision to third parties can be evaluated in terms of the relative occupancy of the TPs in the years following XFEL constructions:
  - **TP1: ~80%**
  - **TP2 & TP3: ~15%**
  - **TP4: ~ 25%**
- The costs charged to the third parties include personnel costs, consumables, etc, + 10% overhead to cover administr. costs
- Evaluation of the economic impact of the services on the sustainability of the TPs has not been carried out
  - one can assume that the occupancy figures provide a rough estimate of the **fraction of running costs that are covered** by revenues from the services provided to third parties.

DESY - Access to sevices

- Specific efforts have been dedicated to **improve the organization of service provision** at DESY to handle the interaction with external entities in the most effective way, both at the technical and commercial/administrative level.
  - **standard procedures** have been established in collaboration with the DESY Innovation and Technology Transfer (ITT) Service
  - three ITT persons take care of the **administrative procedures** and act as an interface between the customers and the technical experts.
  - usually, it only takes approx. **three days to return a quotation** for a standard service request.
- No special effort has been made to **disseminate** among possible industrial customers information regarding the availability of the TPs services;
  - this usually takes place only indirectly through **meetings and discussions** inside the relevant communities.
  - DESY is currently working on a **sales strategy** for high-tech services (non SRF related) which will include the development of business plans for the services in order to approach the markets in a **more efficient way.**

Elettra TPs

- Elettra provide services using the technology platforms originally setup for internal goals, the most relevant being the following:
  - **Magnet test lab**
  - **Vacuum chamber and components development facility**
  - **Radiation measurement lab**
  - **Mechanical workshop**
  - **Biological sample lab**
  - **Chemical and nano-carbon labs**
  - **Thermal analysis lab**
  - **RF components test lab**
  - **Electronic for detectors development lab**
  - **Optical and X-rays measurement lab**

Elettra – the impact

- In the last 5 years many of the internal facilities have provided services to **more than 30 industrial companies and Research Institutions**, besides those that have used the beam lines.
- **Magnetic measurements lab**, **Electronics labs** and **engineering facilities** have provided services to industry or other RIs worldwide.
- In some cases Elettra has been asked to reproduce components developed for internal use for third parties.

Elettra – Access to services

- Elettra has an **internal group dedicated to industrial activities** and a specific section of the Elettra web site dedicated to industrial customers; the communication team is active on Twitter and Facebook in disseminating industrial activities, etc.
  - "Industrial services" and "Products" catalogs are also available and updated periodically.
- The team is made up of **6 people** completely dedicated to interact with: beam line customers, **TPs customers** and general administrative and technical support.
  - In addition all the researchers and technicians of Elettra support the activities when required,
- For the requested services or products, an offer could be prepared in just a **few hours** but it may take up to **~10 working days** if it involves several technical internal facilities. The mean delivery time is **3-4 days.**
- Quotations for services and products are based on evaluation of **both direct and indirect costs plus a profit margin**
- In some cases, Elettra take advantage of funding programs provided by the European Community or national or regional funds. This includes cases where companies are directly financed to obtain the required services.
  - however this support is not frequent because the time **needed to get the funds is often too long** with respect to the needs of the customers.

Elettra - Impact

- The relative weight of service provision with respect of total amount of time of researchers, engineers and technicians at Elettra **is less than 10%.**
- The revenues obtained from service provision covers on average a **few % of the total budget** of the facility with fluctuations from year to year. The total amount of revenues per year is between 1 to 3 MEuro.

CEA Technical Platforms

- TP1 - Test beam facilities
- **TP2 - Test stations for SC magnets and large cryogenic components**
- TP3 - Test stations under high magnetic field
- **TP4 - Characterization stations at cryogenic temperature**
- TP5 - Test stations for RF devices and SC cavities
- **TP6 - Chemistry, clean room and assembly complex**
- **TP7 - Characterization and measurement laboratories**
- TP8 - SC magnet winding and impregnation laboratories

- the ones highlighted in bold (**TP2, TP4, TP5 and TP7**) are the most suited for providing services to external parties.
  - These TPs have been setup and then exploited in several occasions for participating in the construction of several research infrastructures world wide.

Experience so far at CEA

Technological Platform	Requests received	Outcome
TP2 - Test stations (TS) for SC magnets and large cryogenic components	3	no contract
TP4 - Laboratory for cryogenic mechanical tests	7	1 contract, 1 request pending
TP6 - Clean rooms for cavity assembly	-	
TP7 - Laboratory for chemical treatment of SC cavities	some	no contract

CEA - Difficulties

- The main difficulties in responding to external requests and in successfully negotiating an agreement, have been related to:
  - existing commitments **saturating the available personnel work cycles**;
  - facilities not setup for being used multiple times and to address potential different needs; this is most severe for the largest and most complex platforms;
    - **operational costs are often rather high**
    - requested services would require **customization of the setup** that may induce additional costs
- **regular maintenance and upgrading of obsolete components would be needed** to keep the equipment in good operational state;
  - in some cases the large construction projects do not provide the necessary continuity of support

Summarizing...

- even in those cases where services to industry are **regularly provided,** the financial impact on the **total operational costs** of the TPs is limited and clearly dependent on the **type of TP**
  - revenues can cover from zero to 85% of the operation costs, depending on the platform; however the mean utilization of the platforms is rather low, < 10-30%
- even with stronger efforts to facilitate full exploitation by industry, the associated revenues cannot become **the main source of support**
- however, maintaining a certain level of exploitation by industry is felt to be important since, it plays a key role in securing **long term funding from the funding agencies** and **can be strengthened** by actions that might be facilitated by a cooperative approach among within the European TI:
  - interventions aimed at improving the **platforms versatility and to reduce their operations costs** and at **securing dedicated personnel** to interact with industry
  - efforts aimed at **motivating the personnel**
  - coordinated action for streamlining the **interaction with potential users** and increasing the **visibility at European and International level**
  - initial support by programs that **facilitate the exploitation** by companies through the provision of incentives with some rapidly accessible contributions

Indirect impact to sustainability

- the indirect impact of exploitation by industry to the sustainability of TFs is important for the following reasons:
  - it strongly enhances the **visibility of the Labs** role beyond the core research business, not only towards industry and other labs, but also with **respect to the funding agencies**;
  - it provides new **motivations and stimuli for the technical people involved**;
  - it provides opportunities for **maintaining the equipment operational and to preserve and further develop technical competences**;
  - it supports **education of young scientists and engineers coming from nearby but also international universities**;
  - it represent a good example of **effective synergy** with the European Industry environment whereby companies can make temporary use of test setup that would otherwise require large investment to be fully equipped, e.g. when cryogenic systems are needed.
- on should also not forget that in some cases the existence of the TPs is essential for industry for providing test facilities that private companies cannot acquire just for their own use, given the size of the investment.

Further activities for the future

Activities with industry should continue in the framework of the future AMICI collaboration and within the ARIES II project, capitalizing on the feedback that we have receveid in the industry forum

- **More extended involvement of companies:**
  - define interactions models and procedure to include industry in the **early phases of R&D projects**
  - enhance the exploitation of **industrial experience in the design of prototypes** to facilitate the adoption of **optimal engineering solutions** and to make it possible to **reach more efficient and economic final productions**
  - verify the possibility of involving companies in **organization and management of large testing/validation campaigns** to be carried out inside the TFs.
    - contributions from industry may also be useful in the **design and construction of the TPs as well**
- **IP management / compatibility with European industry engagement rules:**
  - further work is needed to address the **most critical aspects of the IP management** in R&D activities in collaboration with industry that AMICI has
  - it's also important that the rules are as much as **possible homogeneous** across the countries to avoid multiple negotiations