Booklet of case studies
and advocacy paper

ENRIITC is funded by the European Framework for Research and Innovation Horizon 2020, under grant agreement 871112

Content

1. Executive Summary

This document has been created to provide a single resource of the various materials generated as part of the ENRIITC project relating to industry case studies and outreach activities. The materials have been extracted from the various deliverables from the project and, in some instances, from the underlying source material such as recordings. In the current document, links and/or references are provided to the various sources.

There have been a number of initiatives which have broken new ground or initiated novel links between the RI and industry. The aim of the current document is to enable these products and learnings from ENRIITC to continue after the project formally ends. The following activities and deliverables are relevant and are linked or referenced here.

- Reporting of a series of eight webinars, covering various aspects of training needs and including recommendations for future training topics and how to effectively organise future trainings and events, both face-to-face and online (and hybrid). *Deliverable 4.1.*
- Summary report on pilot brokerage events. Five events took place organised by ENRIITC members, of which three were European and two were national. Three events involved face-to-face interactions, two were virtual. Topics covered included health care and physical science and engineering and explored the potential of cross-sectoral matches. In addition, project associates were invited to apply for budget available for pilot events. Five such events took place and are also reported. *Deliverable 4.2.*
- Successful industry-RI interactions case catalogue. Some 23 cases of interaction with both large and small companies were collected, across a range of ESFRI domains, with information and analysis. *Deliverable 4.3.*
- Practical step-by-step guide for ILOs and ICOs to organise brokerage events. A detailed guide with recommendations for steps prior to, during and following the event, for both physical and virtual events, and including appendices with handy check lists and descriptions of various digital brokerage event tools available. A highly valuable source for all involved in such events. *Deliverable 3.4.*
- Drivers and barriers in industry-RI relations. An analysis of what works well and what not, based on 19 interviews with companies, comprising seven as users and twelve as suppliers. *Deliverable 2.4.*
- Report on the mapping of industry as a supplier and user. An in-depth presentation of the relation between research-infrastructures and industry, based on two questionnaires targeting ICOs and ILOs that work at or are appointed to a specific international RI. *Deliverable 2.1.*
- Policy paper on the sustainability of the ENRIITC network. *Deliverable 1.5.*

2. Working with industry: resources and examples

The Commission makes clear that strong and connected innovation ecosystems are a key ingredient to drive Europe's competitiveness and ensure the health and wellbeing of its citizens. Indeed, in the European Innovation Agenda, adopted on 5 July 2022, it states that "*innovation shapes markets, transforms economies, stimulates step changes in the quality of public services and is indispensable to achieve the overarching objectives of the twin green and digital transition.*"

RIs are a key player in the innovation ecosystem.

A major element of the European innovation landscape is Research Infrastructures (RIs). In an EIRO Forum paper published in May 2020 about the value and impact of RIs it states that they are: *"pivotal in sustaining and enhancing the competitiveness and world-class excellence of European science, and have significant value for and impact on European industry, society and economy."*

ENRIITC findings on the importance of RI-industry collaboration.

The ENRIITC "policy paper" outlines a number of **issues that were identified in the first two years of the project that need to be tackled to improve RI-industry connections:**

- The community is diverse, covering many scientific disciplines, countries and types of infrastructure (distributed, single sited etc).
- The roles of Industry Contact Officers (ICO) and Industry Liaison Officers (ILO) are often poorly defined and even disconnected from the strategy of the host organisation and this prevents exploiting the innovation potential for co-development. ENRIITC proposes a strategy for the training of ILOs and ICOs to fuel the collaboration between Research Infrastructures and Industry in order to open new markets.

- A model for implementing the recommended key actions at the RIs needs to be developed.
- RIs remain mainly isolated in the innovation ecosystems and recommendations for how to engage were presented as part of the ENRIITC project. *Deliverable 3.2*.
- The PERIIA network has managed to gather European ILOs in an informal network which should be giving a more solid foundation in a joint ILO-ICO sustainable platform.
- ILOs and ICOs face similar challenges and barriers for engaging companies and should learn and interact with one-another. In the innovation area, the issue to exploit the synergies to improve impact is still unresolved. A portal for showcasing RIs' services tailored to industry is missing, although initiatives have been taken for the environmental domain.

2.1. The principles

Based on the results of the project thus far, **a number of guiding principles that are important in establishing a sustainable community came out:**

- Research Infrastructures should be regarded explicitly as part of a specific innovation ecosystem on a European scale.
- The uniqueness of this ecosystem is that it can facilitate and support science and innovation along sustainable and long duration value chains, ranging from low to high Technology Readiness Levels (TRLs); from new technology development to technology transfer and product development.
- In order to give these value chains the required continuity and perspective, cooperating partners need to share vision and commitment during the entire life cycle.
- Obstacles to these goals need to be removed on a truly European scale, sharing common standards and a multidisciplinary approach, leading to level playing fields for all partners.

Establishing an innovation and industry services central support hub.

In the ambition of a follow-up project, ENRIITC will establish an "Innovation and Industry Services Central Support Hub". The idea is for an online platform to deliver training, connectivity and professional development for ILOs and ICOs, while also streamlining industry engagement with a common pathway to handle the flow of requests from companies to RIs.

Demonstrating the capacity of RIs to support innovation: the case studies catalogue.

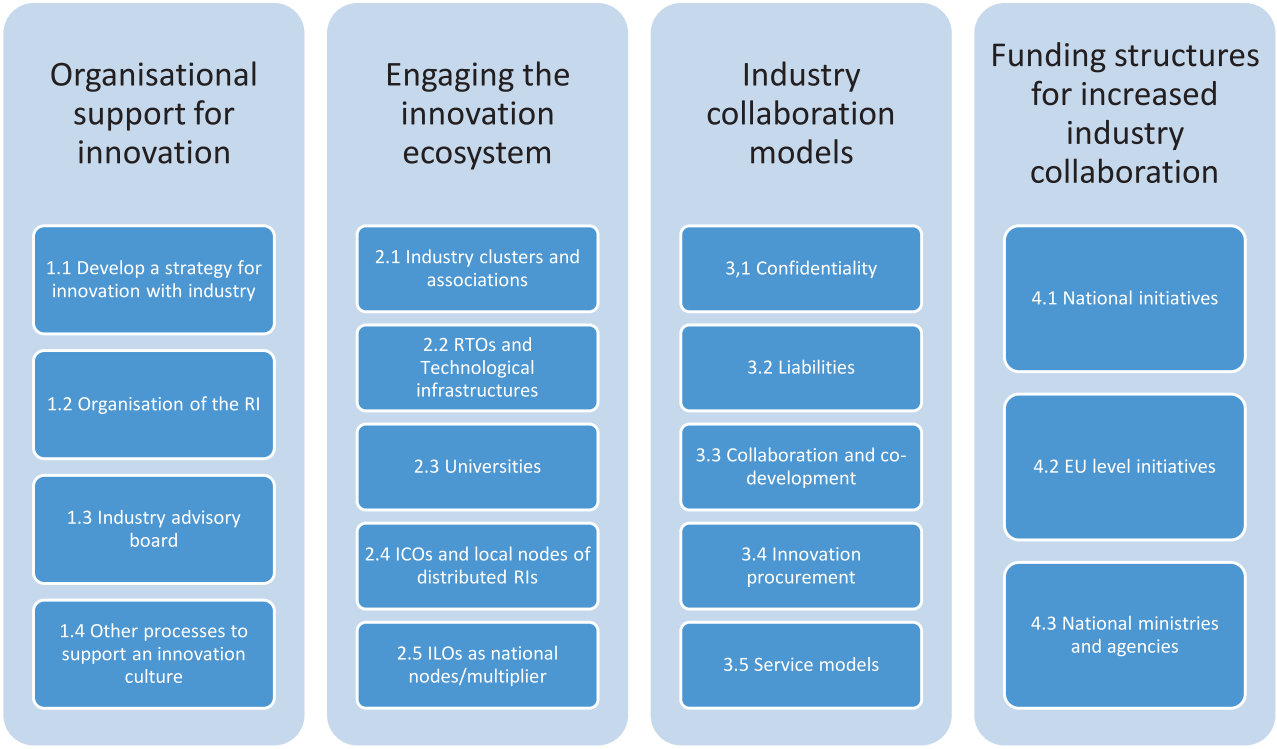
Through a number of case studies covering all ESFRI scientific domains, the next part of this document is showcasing the capacity of RIs to support innovation/to innovate, to be the engine of high technology development that have market impact and different market applications.

The full policy paper will be available by the end of 2022, and published on the ENRIITC website (enriitc.eu)

2.2. ENRIITC set of recommendations for ILOs and ICOs and Key Results and Messages

The following recommendations have been prepared:

- RIs need to **engage in strategic partnerships with local innovation ecosystems** to better engage with industry. See the recommendations from ENRIITC about how to get started.
- The European innovation ecosystem needs to have highly skilled ICOs and ILOs to fuel the collaboration between Research Infrastructures and Industry in order to open new markets. Look at the **Strategy for the training of ILOs and ICOs** developed by ENRIITC to achieve this goal.
- ENRIITC proposes a new "**Research Infrastructures Innovation Preparedness Roadmap**" consisting of five main initiatives to exploit the innovation potential of RIs.
- ENRIITC has prepared 17 key actions in the "Strategy for innovation and industry-RI cooperation" that Research Infrastructures should consider for improving the innovation with industry, engaging the innovation ecosystem, adopting new industry collaboration models, and finding new funding schemes for industry collaboration.
- ENRIITC encourages the formation of a **centralised hub** at European level to support ILOs and ICOs with their work to engage industry towards innovation.



17 key actions in the "Strategy for innovation and industry-RI cooperation"

2.3. Event guide

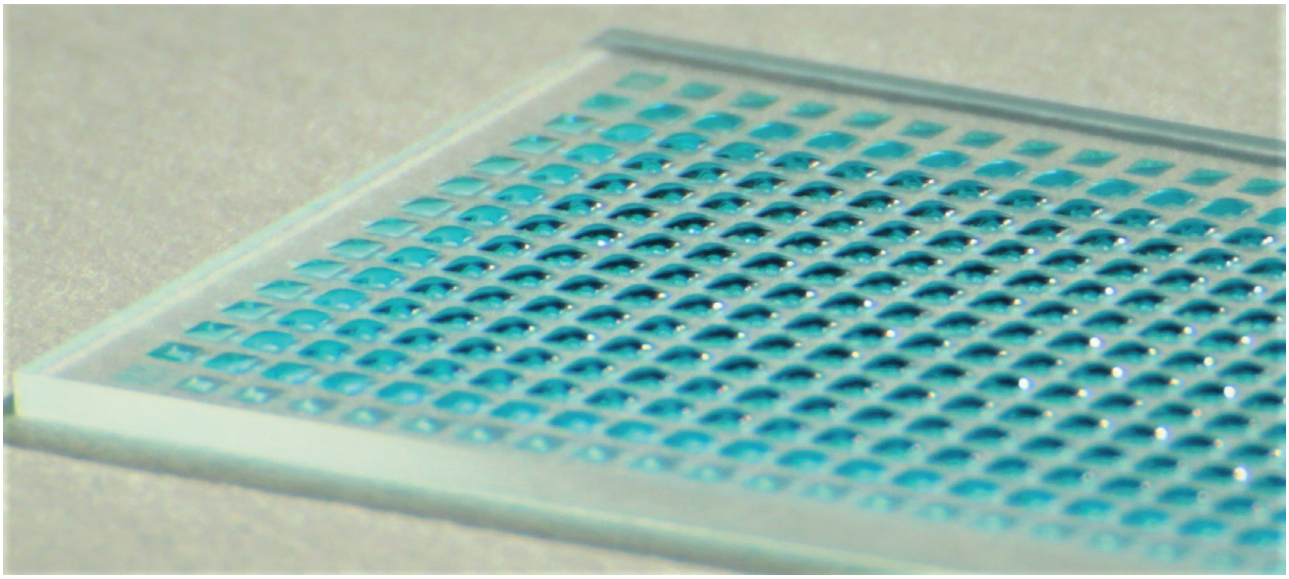
The ENRIITC events guide describes a practical step-by-step set of recommendations for ILOs or ICOs to organise brokerage events of different kinds, in person and virtual, with the purpose of fostering collaboration between industry and research infrastructures in different areas (e.g. industry as a supplier, user, co-creator or technology transfer partner).

ENRIITC set out to test the different event flavours:

- **Webinar:** online meeting or presentation held via the internet in real-time, usually of short duration, with two kinds of participants (speakers and audience), and limited interaction between them (usually written questions from the audience to the speakers).
- **Workshop:** meeting at which a group of people with a common interest engage in intensive discussion and activity on a particular subject or project. There is much more interaction between speakers and audience and the meeting is often coupled with networking face to face meetings. Workshops may be physical or digital.
- **One-to-one matchmaking meeting:** short meetings between two parties with the purpose to engage participants and give them opportunity to build relationships and to communicate their messages directly to a counterpart.
- **Virtual exhibition:** an exhibition where participants are invited to market their offerings in a virtual platform.

3. Case studies

3.1 AQUARRAY



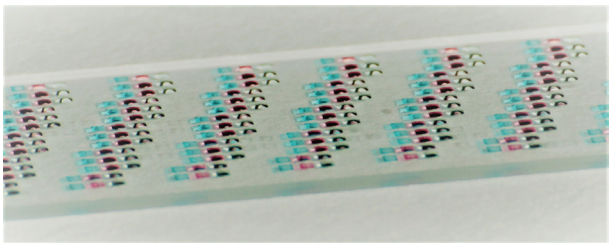
The challenge

Microplate technology has been used for drug screening for a quarter century. Due to surface tension and capillary effects, it faces significant technical challenges and often cannot be readily scaled beyond the 384-well plate format. Screening systems using microtiter plates are characterised by a high degree of automation, consumption of a large number of cells, and large quantities of reagents. In addition to the high capital and maintenance costs and the need to provide specialized expertise to operate these sophisticated systems, this results in significant expenditures for consumables such as cells and reagents for a fully functional cell screening setup. According to market research, microplates and reagents account for 28% or $4.9 billion of the total HTS market.

Currently, microplates are the most widely used. Their advantage is wide availability from various manufacturers and relatively low price. However, microplates require high consumption of reagents and cells, which outweighs the low prices of these consumables and results in high overall costs for HT campaigns. In addition, the high cost of HTS limits its use and dissemination in small- to medium-sized biotech companies and research laboratories. In addition, the limited availability of human primary cells (e.g. cells isolated from liquid or punch biopsies) further limits the use of HTS in in vitro diagnostics to identify optimised patient treatments in precision medicine.

The solution

AQUARRAY's product, the Droplet Microarray (DMA), is a planar array of hydrophilic microspots separated by a superhydrophobic grid prepared on transparent glass or steel slides. AQUARRAY has patented several methods for coating slides with these grids. One aspect of AQUARRAY's innovative DMA technology is based on a production process that uses high-performance nanomaterials that are functionalised down to the micrometre scale, replacing the physical barriers between compartments that are common in microplates. Due to the extreme contrast between the wettable and non-wettable compartments, aqueous solutions are entrapped in the hydrophilic spots of the DMA and self-organise to form high-density nanolitre droplet arrays. Since each droplet can serve as a microreservoir for culturing cells, the DMA has been developed, optimised and validated for miniaturised, mainly but not exclusively biological and cellular applications. Due to the extremely high surface tension, the droplets remain stably suspended even when the DMA is turned upside down. This enables cell cultivation in hanging droplets for the generation



of cell spheres and organoids. Another technology enables the generation of a grid pattern compatible with mild organic solvents such as DMSO, which is often used in screening applications. In addition, this technology enables the use of DMAs for applications such as MALDI-TOF mass spectrometry, infrared measurements, and on-chip synthesis, to name a few. The planar surface of DMAs offers further advantages, as the sample carrier also serves as a planar object carrier for subsequent measurements. In the case of MALDI-TOF mass spectrometry, for example, this leads to better measurement results and higher sample density.

A typical drug screening with cells is performed on a DMA with 672 spots of 1 mm in a total volume of 150 nl of complete medium with 1-300 cells. This opens groundbreaking new possibilities, especially for screening valuable and rare cell types, patient and stem cells. Finally, these features pave the way for single cell applications.

The DMA will therefore have a major impact on future developments in basic life science research, drug discovery, diagnostic applications and precision medicine.

The result

AQUARRAY is dedicated to helping customers take high-throughput screening to the next level. Through consistent miniaturisation, we enable the previously prohibitively expensive screening of valuable, expensive and very limited cells and reagents.

The DMA not only enables ultra-miniaturised screening, but also results in tremendous cost savings for cells and reagents. In a typical cell-based screening campaign, cell and reagent costs are reduced by a factor of 100 and 1000, respectively.

The DMA opens new horizons for high-throughput experiments: Biological assays that were previously not feasible due to the limited availability and high cost of valuable biological materials, as well as extremely miniaturized chemical and biochemical experiments (MALDI-TOF, IR, on-chip synthesis) now become possible.

AQUARRAY's DMA technology has several significant advantages over microplates while offering the same variability. These advantages are:

- Reduction of reagent costs by a factor of 1000,
- Reduction of the number of cells required by a factor of 100,
- Standard glass bottom enables instant in situ microscopy,
- Applications beyond the microplate can be realized,
- Higher number of data points per area,
- DMAs are filled quickly due to their small volume.

Learn more

www.aquarray.com

EU-OPENSCREEN

is a not-for-profit European Research Infrastructure Consortium (ERIC) for chemical biology and early drug discovery, that supports all stages of a chemical tool development project, including assay adaptation, high-throughput screening, and chemical optimisation of the 'hit' compounds.

EU-OPENSCREEN aims to support global scientific and economic competitiveness of Europe through delivering public health benefits. In the future, it will act as an innovation accelerator for new start-ups.

Learn more

www.eu-openscreen.eu

3.2. CARBIOS

Scientists create a plastic-eater enzyme that breaks down plastic

The challenge

We have all seen the pictures of underwater animals threatened by surrounding plastic in the middle of the ocean. This is testament to a reality where plastic recycling processes are less than optimal today.

Estimates show that out of the 359 million tons of plastics produced annually worldwide, 150–200 million tons accumulate in landfills or in the natural environment. Today, French scientists from the Toulouse Biotechnology Institute (TBI, Université de Toulouse, CNRS, INRAE, INSA) and the start-up Carbios have engineered an enzyme that can convert 90% of poly(ethylene terephthalate) (PET) back to its starting materials. And that, within hours.

Poly(ethylene terephthalate) (PET) is the most abundant polyester plastic, with almost 70 million tons manufactured annually worldwide for use in manufacture bottles, polyester clothing fibres, food containers, and various thermoformed packaging and components. The main recycling process for PET, via thermomechanical means, results in a loss of mechanical properties. As an example, only about 30% of the plastic that goes into bottles gets turned into new plastic. This new plastic is often of lower quality, so it is used in carpets or textiles that will ultimately end up in landfills anyway.

The solution

"We screened several cutinases formerly reported to break down PET, including the LCC, which turned out to be the best, after being forgotten for many years", explains Sophie Duquesne, researcher at the TBI. The team reengineered the enzyme and switched out the amino acids for activity-improving and heat-stabilising ones. To that end, thanks to the access to the crystallisation facility provided by the Structural Biophysics Team of the Institute of Pharmacology and Structural Biology (IPBS, Toulouse), the team collected data from hundreds of crystals on ID30B beamline at the ESRF and at the synchrotron ALBA and subsequently, TBI researchers solved the structure of the new enzyme. The novel enzyme can biologically depolymerise all PET plastic waste in an extremely efficient way by increasing the degradation yield of PET waste to 90% in 10 hours, a significant upswing from the initial degradation yield of 1% after several weeks. "This experiment shows how synchrotron sources, and in particular the ESRF, can do its bit to contribute to tangible new technology that will lead us to a cleaner environment in the years to come", says Gordon Leonard, head of structural biology at the ESRF.

CARBIOS

Enzymes powering the Circular Economy

The result

"Carbios' recycling process, the first of its kind, initiates a real transition to a circular economy and can better prevent plastic pollution from harming our oceans and planet", explains Alain Marty, professor at the University of Toulouse and Carbios'

Chief Scientific Officer, as well as corresponding author of the paper. “This innovative technology also paves the way for recycling PET fibres, another major challenge in guaranteeing a clean and protected environment for future generations”, he concludes.

Learn more

www.carbios.com

ESRF

European Synchrotron Radiation Facility

With a brand-new generation of high-energy synchrotron, the ESRF is the world’s brightest X-ray source and a centre of excellence for fundamental and innovation-driven research in condensed and living matter science. Located in Grenoble, France, the ESRF owes its success to the international cooperation of 21 partner countries.

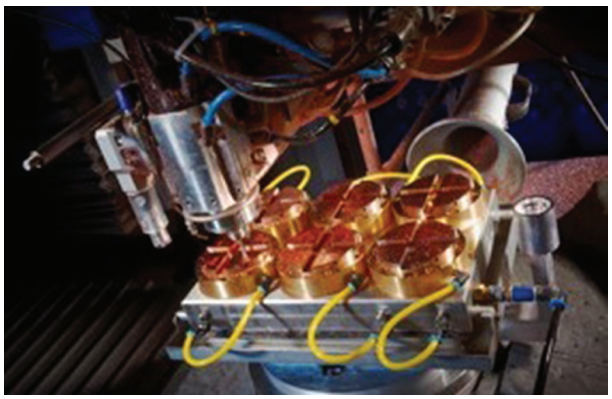
On August 2020, the ESRF opened its completely rebuilt X-ray source, ESRF-EBS (Extremely Brilliant Source), the world’s first fourth-generation high-energy synchrotron. ESRF-EBS opens new vistas for X-ray science in imaging condensed and living matter from metre to nanometre scales, enabling scientists to address the global challenges facing our society such as health, climate change and environment, but also energy and innovative industry.

Learn more

www.esrf.eu

3.3. CLIC Technology

high acceleration, high control, and normal conductivity



The challenge

The spin-off of CLIC technology (Compact Linear Collider) has been under development for around 30 years for the field of fundamental particle physics research. During the past decade, this technology has matured to the point where it is being transferred to applications beyond high-energy physics.

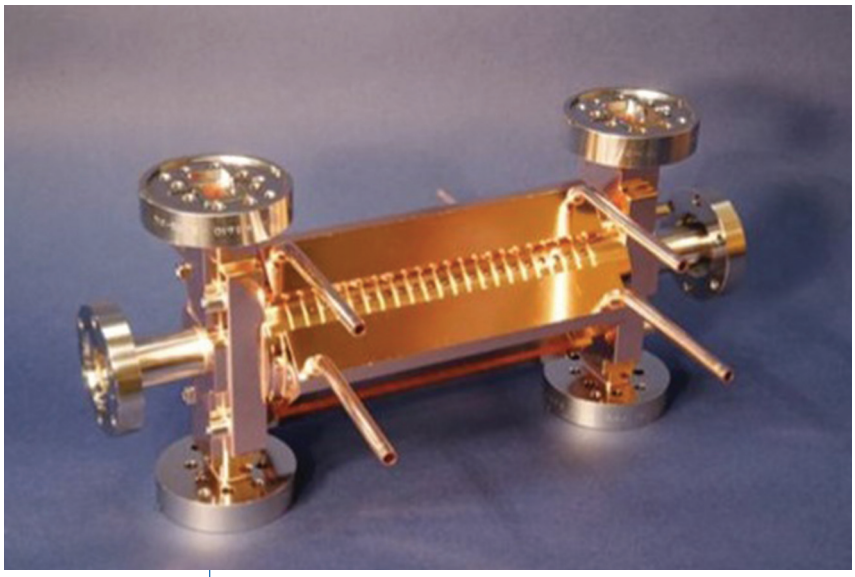
The solution

With CLIC, the goal is to achieve higher acceleration gradients to realise higher particle energies over shorter distances. From the applications perspective, it's reasonable to believe that these characteristics are key to introduce disruptions to existing markets and potentially create entire new markets.

The result

CLIC technology, both the high-frequency and high-gradient aspects, has the potential to significantly reduce the cost of such X-ray facilities, allowing them to be funded at the regional scale.

CERN



CERN, the European Organization for Nuclear Research, is one of the world's largest and most respected centres for scientific research. Their mission is to:

- provide a unique range of particle accelerator facilities that enable research at the forefront of human knowledge;
- perform world-class research in fundamental physics;
- unite people from all over the world to push the frontiers of science and technology, for the benefit of all.

Together with fundamental research, the Laboratory also plays a vital role in developing the technologies of tomorrow. From materials science to computing, particle physics demands the ultimate in performance, making CERN an important testbed for industry.

Learn more

www.cern.ch

3.4. Kazerne Dossin

KAZERNE DOSSIN

MEMORIAL, MUSEUM AND RESEARCH CENTRE ON HOLOCAUST AND HUMAN RIGHTS

Kazerne Dossin is a museum, memorial, and research centre on Holocaust and human rights. 25,490 Jews and 353 Roma were deported from the Dossin barracks on 28 train transports to Auschwitz-Birkenau between 1942 and 1944. Few of them survived the ordeal. Today the old military base is a serene site of reflection and remembrance, a Memorial.

At the museum, you can immerse yourself in the history of the Holocaust in Belgium. You find testimonies not only of exclusion, discrimination, and mass violence but also of hope and resistance. Reflect on human rights violations, then and now.

Central is a huge photo wall with the portraits of the victims. Unfortunately, the wall is not yet complete. We are still looking for pictures so that we can give a face to each name. Every year the newly found portraits are attached during a ceremony.

As a research centre, Kazerne Dossin has an online and offline archive. The research team of Kazerne Dossin conducts targeted research, shares expertise holds lectures, and issues publications.

Learn more

www.kazernedossin.eu

EHRI
European Holocaust Research Infrastructure

EUROPEAN HOLOCAUST RESEARCH INFRASTRUCTURE

Trans-national Holocaust research, commemoration and education is the mission of the European Holocaust Research Infrastructure (EHRI), and its main challenge is the wide dispersal of sources and expertise across many institutions. EHRI overcomes such fragmentation by connecting sources, institutions and people.

The EHRI Portal enables online access to information about Holocaust sources, no matter where they are located. The Conny Kristel Fellowship gives researchers access to the resources of the world's twenty leading Holocaust archives. EHRI's extensive programme of networking and training brings people together. Last but not least, EHRI promotes innovative tools that advance the digital transformation of Holocaust research.

Learn more

www.ehri-project.eu

3.5. Prior PLM Medical

Improving asthma and other espiratory diseases

The challenge

Prior PLM Medical is a company that specialises in supporting the medical and pharmaceutical industry to develop drug delivery devices from initial idea to end of product life.

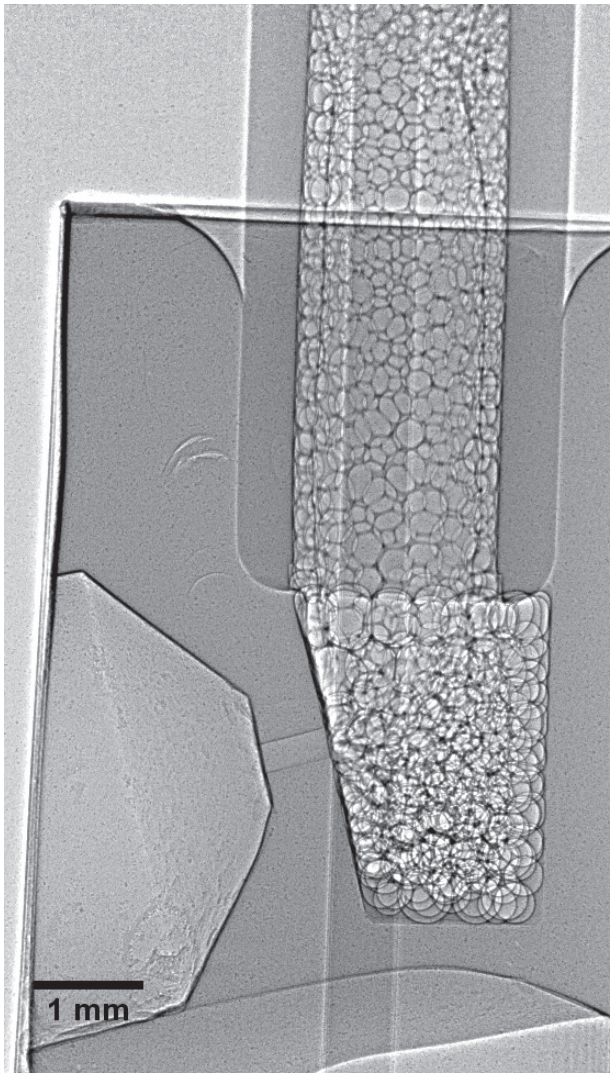
According to the World Health Organisation, over 300 million people worldwide suffer from respiratory diseases such as asthma and chronic obstructive pulmonary disorder (COPD). Inhaled medicine, typically in the form of pressurised metered dose inhalers (pMDI) and dry powder inhalers (DPI), is used to treat these diseases due to the direct delivery and reduced side effects. However, device/treatment efficacy is often quite poor with only 10-20% total lung deposition for most devices on the market.

The solution

In an effort to increase the efficacy of inhaled medicine devices, Prior PLM Medical studied pressurised metered dose inhalers (pMDI) at the ESRF using a monochromatic X-ray beam at beamline ID19. The insights gained from the study were passed on to their clients enabling them to make better design decisions.

The result

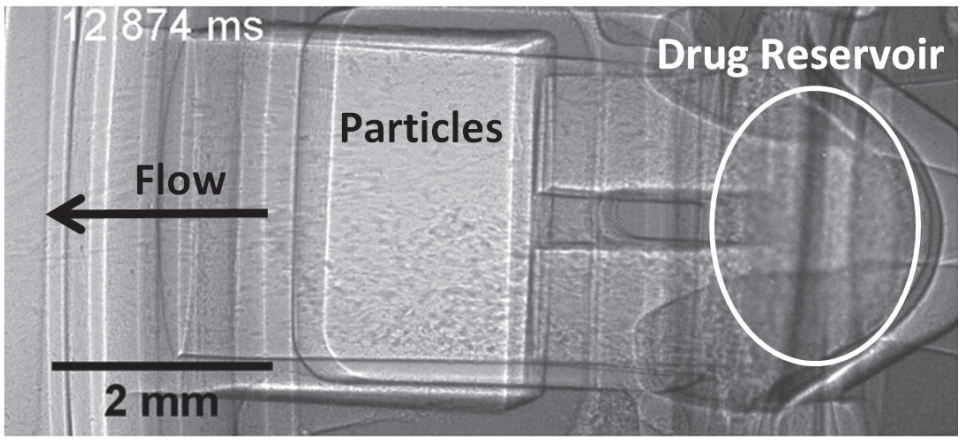
"Our work at the ESRF has allowed us to see what's happening inside both development stage and off-the-shelf commercial inhaler devices and has enabled our clients to make informed design decisions. We also use the facility for our own internal R&D programmes and are very excited by the prospect of the ESRF Extremely Brilliant Source." Alan McKiernan, Research Manager Prior PLM Medical, physicist.



Learn more

www.priors.com

www.esrf.eu



3.6. The RF Systems
are on site, huge challenge from ESS Bilbao

The challenge

Eight years ago, a team of almost 15 researchers from ESS Bilbao made the commitment and accepted the challenge to take over the design, manufacturing, and commissioning of the whole RF systems for the normal conducting section of the European Spallation Source (ESS) proton LINAC.

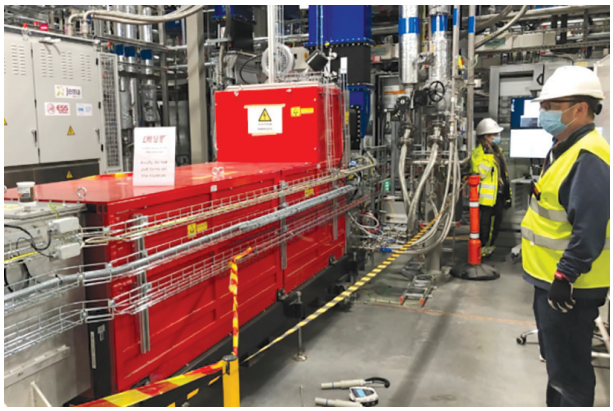
The solution

During all these years, there have been many difficulties that they have had to face. Still, in the end, the effort and work of the whole team in coordination with the industrial partners in Spain have made it possible and most of the RF equipment is already installed at the ESS site in Lund, Sweden. This work has been co-funded by European Regional Development Funds under the FEDER TRACKS project (Transmisore de RF para Aceleradores basados en Klystrons y Estado Sólido).

The result

The ESS project is the world's most powerful pulsed neutron source based on a linear accelerator or linac, which accelerates a proton beam of 62.5 mA current to an energy peak of 2000 MeV.

ESS Bilbao's tasks included the design and prototyping, procurement, integration, factory testing, transportation, delivery, and finally the supervision of the installation and assistance to commissioning of the RF stations at the ESS site in Lund (Sweden). Procurement, integration, factory testing, transportation, delivery, and finally the supervision



of the installation and assistance to commissioning of the RF stations at the ESS site in Lund (Sweden).

ESS Bilbao

ESS Bilbao is a public consortium formed of the Spanish and Basque Governments, bringing knowledge and added value in particle accelerator and neutron scattering science and technologies by leveraging its in-kind contribution to the European Spallation Neutron Source in Lund, Sweden.

Mission: To promote the generation of knowledge in neutron technologies in the widest sense, from the accelerator to the target and instruments.

Vision: To become a centre of excellence in particle accelerator and neutron scattering science and technologies by leveraging our In-Kind Contribution works on the European Spallation Source project.

Learn more

www.essbilbao.org

3.7. Samtack

the use of ALBA Synchrotron Light for improving food packaging

Samtack, is a manufacturer of glues and adhesives specialised in the sector of graphic arts and packaging. The company has developed a new flexible multilayer system, in collaboration with the University of Zaragoza and the Complutense University of Madrid, that contains Selenium nanoparticles and is capable to increase food shelf life.

The challenge

However, not all selenium oxidation states are equally capable to absorb free radicals: while selenium nanoparticles in its elemental state (Se0) have a high capacity, other oxidation states (SeIV or SeVI) are not so effective.

The solution and the result

The samples studied at ALBA consisted of different preparations of selenium nanoparticles plastics laminates and solutions to check the amount of elemental selenium and other selenium oxidation states in each sample. The results obtained provided to Samtack very valuable information to improve the synthesis of the new flexible multilayer system.

Learn more

www.samtack.es

ALBA

ALBA is a 3rd generation synchrotron light facility located in Cerdanyola del Vallès, (Barcelona), being the newest source in the Mediterranean area. It is a complex of electron accelerators to produce synchrotron light, which allows the visualisation of the atomic structure of matter as well as the study of its properties.

ALBA currently has ten operational state-of-the-art beamlines, comprising soft and hard X-rays, which are devoted mainly to biosciences, condensed matter (magnetic and electronic properties, nanoscience) and materials science. Additionally, four beamlines are in construction (low-energy ultra-high-resolution angular photoemission for complex materials, microfocus for macromolecular crystallography, absorption and diffraction and fast X-ray tomography & radioscopy).

Learn more

www.albasynchrotron.es

3.8. S2 Innovation

unconventional approach and the newest technologies made in Poland

S2 Innovation is the only company in Poland delivering control systems and software development services for the most advanced research centres in the world conducting high-tech scientific research. The company was founded at the end of 2017 in Krakow on the basis of experience built during construction of the SOLARIS Synchrotron, an electron accelerator unique in Central Eastern Europe and the largest investment in research infrastructure in Poland in recent decades. S2Innovation specialises in the creation, development and maintenance of dedicated software for monitoring and control of research equipment and/or processes using both open-source tools (e.g. Tango Controls, EPCIS) as well as commercial software.

The challenge

Software plays an increasingly important role in our lives and a similar process is taking place also in the world of science. In particular, advanced research centres, often built of thousands of devices working together, need appropriate, modern and stable software that will not only allow them to conduct experiments, but will also take care of the safety of users, the apparatus (often very expensive), or allow for quick acquisition of experimental data, their analysis and sharing.

Increasingly important are also technologies related to machine learning, artificial intelligence, early detection and prediction of failures, or simply the ability to control relevant processes or access data remotely. These are precisely the technologies and areas in which S2 Innovation operates, aiming to support research institutions to work better, faster and more efficiently using the most advanced software.

The solution

S2 Innovation and MAX IV have developed a model of collaboration called “in-sourcing”. S2 Innovaiton software developers worked closely with MAX IV specialists as one team in an agile model solving the ongoing needs and working on projects, for which the specification and scope are defined very dynamically. What is crucial for this type of collaboration is mutual trust between partners, the ability of the company to provide highly skilled and qualified team members and to work on very demanding and technologically advanced projects, which are often crucial for the development of science in the world.

The result

Therefore, with the S2 Innovation and MAX IV case study, it’s possible to understand why it is necessary to maintain and expand cooperation, especially by looking at investments in scientific infrastructure also from the perspective of opportunities for the development of innovative companies.

Learn more

www.s2innovation.com

MAX IV

MAX IV - Sweden has set out to build the brightest X-ray source in the world. X-rays were discovered 125 years ago and, at the time, they were thought to be almost magic. With the MAX IV facility, Sweden will have the highest quality of X-rays available to scientists from academia and industry.

Although it was officially inaugurated in 2016, it is still intensively developing its R&D infrastructure which leads to the need of qualified personnel and support of the software development companies. Due to the COVID pandemic, a lot of processes slowed down and at the same time many of the research centres started to suffer from an overload of tasks and limited personnel and time.

As a result, MAX IV (and many other research institutions) need help from external companies, but do not have the time and/or resources to describe precisely what is exactly the scope of the work.

Learn more

www.maxiv.lu.se

3.9. Orolia – Seven Solution

the native leading company in subnanosecond timing

The challenge

White Rabbit (WR) is an extension to Ethernet technology initially proposed by CERN and developed in collaboration with many institutes and companies. It allows users to synchronise remote devices within one billionth of a second (1 nanosecond).

Orolia Spain (formerly Seven Solutions) joined the White Rabbit initiative at a very early stage back in 2010, as one of the first industrial partners. This translated into a remarkable collaboration opportunity with worldwide leading scientific institutions such as CERN, GSI, NIKHEF and DESY.

The company's participation was partially funded by CDTI (the Spanish innovation agency) with a national R&D grant in the framework of the national framework for Scientific Research, Development and Technology Innovation 2008-2011, "Program for supporting Industry for Science 2010". The grant title was: "Research Project applied to the design of a high-performance switch". This represents a clear successful case of a public-private collaboration that transformed a small co-funded seed capital into a private initiative at Orolia that eventually led to a full set of competitive products and services.

Orolia is the original designer of the main and most advanced device of the open hardware White-Rabbit ecosystem, the White-Rabbit Switch. The hardware design for the White Rabbit switch is licensed under the CERN Open Hardware License (OHL) while the firmware and driver software also is available under the "open" licence.

The solution

In the first stage, the target was timing systems for particle accelerators but soon the goal shifted to a much broader scope. This pushed the technology to evolve into a more general solution to be used in astrophysics facilities, metrology institutes, fintech datacentres, or radar applications.

From the early beginning, Orolia's involvement represented a remarkable innovation for the company not only on the technological side but also on the business side, pushing the company to a higher quality level for a very demanding, innovative, and competitive business segment. This facilitated large facilities and companies to rely on small SMEs. Orolia Spain was born as a spin-off from the University of Granada back in 2006, but can also be somewhat categorised as a CERN spin-off because of their support and training during the initial stages of the project. This represents a differential value (the CERN touch) in very innovative markets.

The result

In a later stage and leveraging on this initial collaboration with CERN, Orolia transformed White Rabbit into a full industrial solution, offering breakthrough products and features as well as services and support. They also evolved their business model, making compatible the design of open-source solutions with additional proprietary industrial solutions.

White Rabbit is now a commercial solution used by hundreds of customers worldwide. Orolia, native in subnanosecond timing, is the leading company in this technology, offering the most complete and interoperable ecosystem of products and services.

Learn more

www.orolia.com

White Rabbit

The White Rabbit Project is a multilaboratory, multicompany and multinational collaboration to develop new technology that provides a versatile solution for control and data acquisition systems. The project was started within an effort to renovate the current CERN control and timing system. Since then, it has expanded beyond this initial application. One of the reasons for such expansion is the open source paradigm used in the project for the development of hardware, gateware and software. Another reason is the compatibility with standards.

Learn more

https://white-rabbit.web.cern.ch

3.10. Techtra

TECHTRA
TECHNOLOGY TRANSFER AGENCY

The challenge

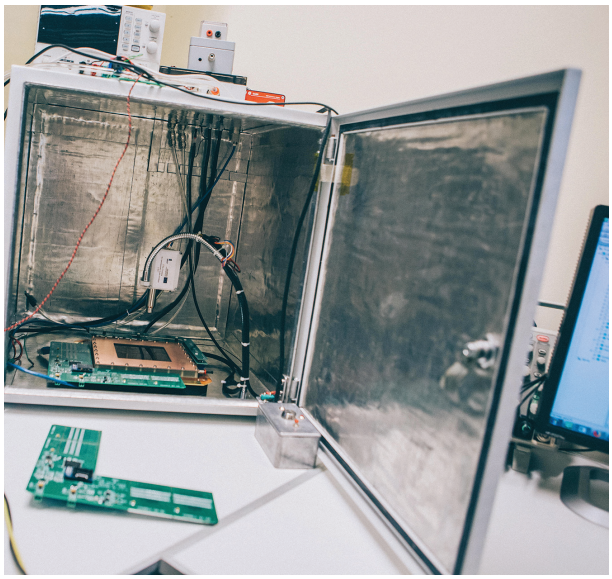
Economic progress is mainly achieved through the development and implementation of new technologies in industry. Undoubtedly, works in the field of basic research constitute the basis for further solutions applied in various fields of science and technology. Physics research is an excellent example of this trend. It is worth pointing out the discoveries of X-ray detectors (medicine, non-destructive testing, others) and semiconductors (computers, refrigerators, etc.), without which it is difficult to imagine today's civilisation. Introduced in 1968 by Georges Charpak at CERN (European Organization for Nuclear Research) multiwire proportional chamber revolutionized the particle detection systems in HEP (High Energy Physics) laboratories. In time, new generations of the invention have been implemented for fast detection and localisation of charged particles. One of them is based on GEM (Gas Electron Multipliers) microstructures. The unique feature of these detectors is high resistance to radiation, low cost, and large active areas of several square metres. For this reason, in many HEP laboratories, semiconductor detectors used until recently have been replaced by GEM detectors. The technology of producing the microstructures, however, is very sophisticated, which for a long time prevented the commercialisation of the production process.

The solution

Based on the work carried out, a licence agreement was signed between CERN and Techtra to transfer MCV (Micro-Chemical-Vias) technology in 2005. In the following years, the possibility of commercial production of Gas Electron Multipliers was gained. Techtra is the only European commercial entity with the competencies and rights to produce GEM microstructures. Based on the insight into the market of High Energy Physics laboratories and the conducted research and development works, the company has developed and implemented production complete detector systems based on GEM technology. Such systems consist of a detector, electronic data acquisition, and processing system, and dedicated software for the visualisation of measurement results. Our products have found buyers in many research centres, including in Europe, USA, Canada, India and others.

The result

The Techtra company noticed that scientific laboratories such as CERN, apart from scientific activity, are an excellent source of innovative technologies and products. As the company gained



unique competencies in the field of HEP and product technology, it has become a natural partner of scientific teams designing next-generation experiments. Techtra is involved in several R&D projects like BESIII (Beijing Spectrometer) and the development of future particle detection technologies. At the same time, the company is a producer of specialised films for users from all over the world.

Learn more

www.techtra.pl

4. Conclusions

Collaboration between industry and Research Infrastructures is a key factor to increase innovation. In the ENRIITC project we analysed how it may be created, including some recommendations. We conducted surveys among people responsible for technology transfer to propose the best ways to stimulate innovation. We conducted a series of pilot meetings, webinars, promotional campaigns; also we collected case studies of companies that are doing business with RIs.

The most important issue to emerge is the value of collaboration between partners from different countries: building consortia, exchange of experiences, training and knowledge dissemination. Additionally there is a need for, more innovation brokers who are aware of the RI offer and successfully encourage industry to use it.

All identified good examples and recommendations on how to stimulate technology transfer from RI to industry are included in the booklet.

In the course of the ENRIITC project a step by step list of guidelines for organising brokerage events was produced as a deliverable which also fed into a series of pilot brokerage events. These events were both at the national and European levels and covered a range of domains. It is clear from these activities that post-COVID virtual events will continue to be part of the brokerage scene, in addition to face to face meetings and hybrid events. Events featuring links between different domains are possible but more difficult to organise. Nonetheless a start was made and the future potential demonstrated. It was also found that small, low budget projects can serve as useful instruments in exploring unusual collaborations and potential future technology transfer. Useful knowledge was gained on how to reach out to SMEs and understand better their needs and constraints. First steps were taken to move both ICOs and ILOs out of their comfort zones, creating a base to continue to build upon.

Training is vital for progress. A series of webinars addressed various aspects of the ILO and ICO roles, recommendations and shared experiences in on line interaction, and a range of issues (e.g. IP, crafting agreements, legal issues) which emerge repeatedly as important to setting up collaborations. The webinars were well attended and linked persons with different roles, including funding and government organisations in addition to RI and industry representatives. This diversity is seen as important for generating mutual understanding.

Perhaps most importantly, the ENRIITC project has succeeded in breaking ice between RIs and sectors previously relatively unknown to one another. This in turn has shown the potential for brokerage and in particular for expanding the traditional ICO and ILO roles to encompass technology transfer and opportunities for industry as a user not only a supplier.

5. Word Clouds

These word clouds show the language used in ENRIITC events over the duration of the project.

Transcripts of all #ENRIITCyourCofffee episodes (36 in total) and all ENRIITC your Knowledge sessions (8 in total) were downloaded.

Filler words such as “ok” and “and” were removed.

Here are the resulting word clouds expressing the terms that were used.

The larger the word, the more frequently it was used.

6. Project Deliverable Information Sheet

<table>
<tr><td rowspan="8">ENRIITC Project</td><td colspan="2">Project Ref. No. 871112</td></tr>
<tr><td colspan="2">Project Title: ENRIITC - European Network of Research Infra-structures & Industry for Collaboration</td></tr>
<tr><td colspan="2">Project Website: www.enriitc.eu</td></tr>
<tr><td colspan="2">Deliverable No.: D5.2 Informational booklet of case studies and advocacy paper</td></tr>
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<tr><td>Reviewed by</td><td>ENRIITC Steering Board</td></tr>
<tr><td>Approved</td><td>ENRIITC Steering Board</td></tr>
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7. List of Abbreviations

BSBF Big Science Business Forum

CDTI Centre for the Development of Industrial Technology

DTI Danish Technological Institute

EC European Commission

EATRIS European Infrastructure for Translational Medicine

EIROFORUM The European Intergovernmental Research Organisation Forum

EMSO European Multidisciplinary Seafloor and water column Observatory

ENRIITC European Network of Research Infrastructure and Industry for Collaboration

EOSC European Open Science Cloud

EOSC DIH European Open Science Cloud Digital Innovation Hub

ESRF European Synchrotron Radiation Facility

ESFRI The European Strategy Forum on Research Infrastructures

ERA European Research Area

ESS European Spallation Source ERIC

FG Focus Group

PERIIA Pan-European Research Infrastructure ILOs Association

RI Research Infrastructure

WPT Wrocław Technology Park

www.enriitc.eu

The European Network of Research Infrastructures and Industry for Collaboration

2022