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AMICI

Accelerator and Magnet Infrastructure for Cooperation and Innovation
Horizon 2020 / Coordination and Support Action (CSA)


DELIVERABLE REPORT

1ST PERIODIC PROGRESS REPORT FROM 01/01/2017 TO 30/06/2018 DELIVERABLE: 1.5

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	<p align="center">FROM 01/01/2017 TO 30/06/2018</p>	<p align="right">Deliverable: 1.5</p>
		<p align="right">Date: 30/09/2018</p>


Deliverable: Progress and financial 1st reports

Executive summary:

The Report constitutes the Part B of the AMICI Mid-Term Technical Report. It includes explanation of the work carried out by the beneficiaries per WP between 01/01/2017 and 30/06/2018 , and explanation of the progress towards the objectives of AMICI.

Table of content

1. EXPLANATION OF THE WORK CARRIED OUT BY THE BENEFICIARIES AND OVERVIEW OF THE PROGRES	3
1.1. OBJECTIVES.....	3
1.2. EXPLANATION OF THE WORK CARRIED PER WP.....	3
1.2.1. WP1 Management, coordination and dissemination	3
1.2.2. WP2 Strategy	7
1.2.3. WP3 Coordination	11
1.2.4. WP4 Innovation	13
1.2.5. WP5 Industrialization	14
1.3. IMPACT.....	16
2. UPDATE OF THE PLAN FOR EXPLOITATION AND DISSEMINATION OF RESULT (IF APPLICABLE).....	17
3. UPDATE OF THE DATA MANAGEMENT PLAN (IF APPLICABLE)	17
4. FOLLOW-UP OF RECOMMENDATIONS AND COMMENTS FROM PREVIOUS REVIEW(S) (IF APPLICABLE).....	17
5. DEVIATIONS FROM ANNEX 1 AND ANNEX 2 (IF APPLICABLE).....	17
5.1. TASKS.....	17
5.1.1. Milestones	17
5.1.2. Overview of Deliverables.....	18
5.2. USE OF RESOURCES.....	19

	<p align="center">FROM 01/01/2017 TO 30/06/2018</p>	<p align="right">Deliverable: 1.5</p>
		<p align="right"><i>Date: 30/09/2018</i></p>

1. EXPLANATION OF THE WORK CARRIED OUT BY THE BENEFICIARIES AND OVERVIEW OF THE PROGRES

1.1. OBJECTIVES

Development and construction of accelerator based scientific Research Infrastructures (RIs) are going through a deep paradigm change because of the need for large scale Technological Infrastructures (TIs) at the forefront of technology to master the key accelerator and magnet science and technology needed for several fields. Indeed, because of the high technological level and of the increased size and time scale of projects, development and construction require more and more sophisticated R&D platforms on key accelerator and magnet technologies, large-scale facilities for their assembly, integration and verification, large concentrations of dedicated skilled personnel and long term relationships between laboratories and industry. In response to those challenges, a few large platforms specialized in interdisciplinary technologies and for applications of direct benefit to society are emerging. The emerging Technological Infrastructure is aiming at creating an efficient integrated ecosystem among laboratories focussed on R&D, with a long term vision for the technological needs of future RIs and industry, including SME, motivated by the innovative environment and the market created by the realisation of the technological needs of several RIs.

The goal of AMICI is to ensure that

- a stronger and optimised integration model between the large existing technological infrastructures is developed and agreed upon,
- this integrated ecosystem is attracting industries and fostering innovation based on accelerator and SC magnets cutting-edge developments,
- strategy and roadmaps are clearly defined and understood to strongly position European industries and SMEs on the market of the construction of new RIs worldwide, and
- potential societal applications are identified and disseminated to the relevant partners of this ecosystem.


1.2. EXPLANATION OF THE WORK CARRIED PER WP

1.2.1. WP1 Management, coordination and dissemination

The general objective of this WP is the overall management of the project in order to ensure the achievement of the project objectives and the coordination of the work done in the different WPs. Specific objectives are:

- Relations with EC including progress and financial reporting,
- Exchange of information between the partners and with industry,
- External dissemination of the project results,
- Communication and outreach activities.

Since one of the goals of the project was to establish strong relations with industry, one of the first tasks consisted in defining how industry, from large enterprises to SMEs, can be associated to the project and their role in the different WPs.

	FROM 01/01/2017 TO 30/06/2018	Deliverable: 1.5
		Date: 30/09/2018


- **WP1.1 Project management (CEA)**

The project management is ensured by the Project Coordination Team, composed of the Coordinator, the deputy coordinator and a project manager hired for the duration of the project. The PCT is responsible for the general strategy and for the quality of the work and the timely implementation of all the tasks and deliverables. It regularly reports to the Steering Committee (SC), composed of the PCT and WP leaders. Representatives of institutions not responsible of a WP and the person in charge of links with industry are systematically invited to SC meetings. During the period covered by this report, 13 SC meetings were held, most of them through visio conferences.

The PCT has organized the Kick-off Meeting (KoM) on 18th January 2017 in Paris, at the premises of the FIAP Jean Monnet centre. Presentations of the general goals of AMICI and of the five Work Package work plans were given. The open meeting gathered about 50 participants representing all the AMICI beneficiary institutions (10). It was followed by the installation meeting of the AMICI Advisory Group and by the closed meeting of the General Assembly representing the 10 beneficiaries. The Kick-off Meeting was preceded, on 17th January from 14:00 to 19:00, by an AMICI Workshop at the same location, where parallel sessions were organised for the five Work Packages with about 35 participants. All details from the kick-off meeting, including timetable, presentations, participants and satellite meetings can be consulted on the public Web-based [Indico](#) site of this event.

An Advisory Group composed of representatives of RIs and industry has been installed. It is composed of 14 members, 11 of them from industry, 2 from non-European institutions and 1 from a European RI. Their name and affiliation are given in the Table below. Andrew Hutton has been elected as chair of the AG.

Name	First name	
Bethuys	Stéphane	Thales (FR)
Corniani	Giorgio	Zanon (IT)
Dziwoki	Adam	Prevac (PO)
Gehring	Michael	Bilfinger (Babcock) Noell GmbH (DE)
Howland	Patricia	e2v (UK)
Hutton	Andrew	Jefferson National Laboratory (US)
Lancelot	Jean-Luc	SigmaPhi (FR)
Lindholm	Mikael	Scandinova (SW)
McGinnis	David	ESS (SW)
Melhem	Ziad	Oxford Instruments (UK)
Peiniger	Michael	Research Instruments GmbH (DE)
Pellecchia	Antonio	AS-G (IT)
Troxler	Josef	Ampegon (SP)
Yamamoto	Akira	KEK (JP)

	<p align="center">FROM 01/01/2017 TO 30/06/2018</p>	<p align="right">Deliverable: 1.5</p>
		<p align="right">Date: 30/09/2018</p>


The AG has been invited at the kick-off meeting and consulted on the general strategy of the project. The main recommendation to the AMICI Management was to produce a crisp synthetic description of the AMICI goals and justification of the interest for industrial companies to become AMICI partners. Following, this recommendation, a leaflet to present AMICI to industry has been elaborated and 1000 copies have been printed and provided to the AMICI partners for communication during events involving industry.

The 1st AMICI Annual Meeting was held on 21st January 2018 in Uppsala, at Uppsala University, preceded by working sessions of the WPs on 20th February. Presentations of the general status of AMICI and of the five Work Package progress were given, and were followed by a special session about ‘The Technological Facilities that build Europe’s RIs’. The open meeting gathered about 60 participants representing all the AMICI beneficiary institutions, European industries, Swedish agencies, and in the presence of the AMICI EC Officer. All details from meeting, including timetable, presentations, participants and satellite meetings can be consulted on the public Web-based [Indico](#) site of this event. It was followed by the second meeting of the AMICI Advisory Group with 8 of its 14 members present or represented. A closed meeting of the General Assembly was held on 22nd February, during which the progress of the project was endorsed.

- ***WP1.2 Organization of the participation of industry (INFN, CEA, IFJ PAN)***

The main goal was to consult representatives of industry, from both large enterprises and SMEs, to define the best way to associate them to the AMICI project and provide support to the TIs for the following interactions. This task is coordinated by Mauro Morandin who is the Italian ILO for CERN and ensures the links with the whole network of ILOs and TT officers. The list of ILOs setup for AMICI include the ones collaborating with CERN, ESRF, ESS, and Fusion4Energy, for a total of 40 people from 13 European countries (the 7 countries represented in AMICI plus Austria, Belgium, Denmark, Holland, Norway and, Spain,). The list was used first to introduce the ILOs with the AMICI project and, then to extend the invitation to European Industry to participate in the ‘AMICI Partner and Industry Days’ meeting.

The main achievement has been the organization of a ‘AMICI Partner and Industry Days for Scientific Technology Infrastructure’ meeting which took place in Padua, on April 18-19 2017. The meeting gathered 83 participants, with roughly half being from industry (mainly from the countries of AMICI project partners but also from Spain and Denmark) and half from academic institutes. The goal of the meeting was to present the AMICI project to the participating companies, focusing their attention in particular on the Tasks and activities in which industry is going to play an important role, and to collect their comments, suggestions and expressions of interest in order to organize in the most effective way their involvement. At the end of the meeting companies were asked to fill a questionnaire aimed at collecting feedback on the topics that had been discussed during the previous sessions and, expressions of willingness to participate in the activities. The collected answers clearly indicate that there is a common strong appreciation among companies of the scientific and technological support that the TI provides to industry, and the key role this support plays for promoting the development of European high-tech industry. The companies that have expressed their wish to receive information are now included in the project mailing list, while the ones that showed interest in participating in specific activities have been invited by the task leaders to join the relevant working groups.

	FROM 01/01/2017 TO 30/06/2018	Deliverable: 1.5
		Date: 30/09/2018

- ***WP1.3 Administrative and financial project management (CEA)***

The PCT has handled the preparation and finalization of the Consortium Agreement and Grant Agreement, the distribution of the EC pre-financing and monitoring of resource utilisation.

The PCT has organized the meetings of the Steering Committee, General Assembly and Advisory Group and delivered minutes of all these meetings. It provided the logistics and support for the organization of the KoM, Industry Days and 1st Annual Meeting.

- ***WP1.4 Communication and outreach activities (IFJ PAN, CEA)***

The AMICI public website was provided by IFJ PAN, Poland. The domain <http://eu-amici.eu> was registered on 16th of January 2017 and it is paid until 16th of January 2020. The web-hosting period will be extended just before the end of the project for 5 additional years (i.e. until June 2024).

The AMICI public website under the “Technology Infrastructure” tab (http://eu-amici.eu/technology_infrastructure), displays exhaustive descriptions of the Technological Facilities located at European AMICI partner institutes and available to collaborations with industry, including contact information. A search engine allows external potential users to quickly browse the list of Technical Platforms and to identify the most appropriate ones in accordance with their needs (http://eu-amici.eu/technology_infrastructure/search).

Communication includes dedicated pages on which future events are announced (<http://eu-amici.eu/events>) and recent scientific achievements or progress of AMICI activities are reported (<http://eu-amici.eu/news>). Outlines of these sections are available on the home page to facilitate browsing. A glossary (<http://eu-amici.eu/about/glossary>) that clarifies the meaning of terms used in the project is also available.

Finally, the "Industry Involvement" tab gives examples of successful collaborations between European Technological Facilities and industry (http://eu-amici.eu/industry_involvement/success_stories). It also provides access (http://eu-amici.eu/industry_involvement/tendering) to the ongoing calls for tenders, including those below the EU publication threshold not advertised in the EU platform, via the collection of links to various national and institutional websites with searchable databases.

A Share Point database has also been set up, accessible only to AMICI participants in order to efficiently exchange information between the different bodies of the project and between the participants. It provides to registered users an access to an internal project document base, information about meetings and any event related to the project. A dedicated tool to follow up milestones as well as a database for deliverables is provided.

During the period covered by this report, AMICI partners have participated and presented the project in several workshops and conferences. In particular, AMICI has been co-organizing together with ARIES the Accelerator-Industry Co-Innovation Workshop, which was held in Brussels on 6-7 February 2018 with the goal to investigate the tools and strategies to enhance industry-academia cooperation in the particle accelerator community. AMICI had posters or video presentations displayed during the Big Science Business Forum 2018, 26-28 February 2018, in Copenhagen in several country stands, France, Italy, Sweden and Poland. The Table below lists all the events with AMICI participation.



FROM 01/01/2017 TO 30/06/2018

Deliverable: 1.5

Date: 30/09/2018

Participants	Designation	Date	Place	Type	Public reached
CEA	Flyer AMICI	-	-	Flyer	Industry / Policy makers
All	Posters	-	-	Exhibition	Scientific Community / Policy makers / Industry
IFJ-PAN	Website	-	-	Website	Scientific Community / Policy makers / Industry
DESY	DESY PoF in Helmholtz Association	Feb 5-9, 2018	DESY, DE	Participation to an Event other than a Conference or a Workshop	Policy makers
DESY	TESLA Technology Collaboration RIKEN 2018	June 26-29, 2018	RIKEN, JP	Participation to a Workshop	Scientific Community
DESY	SLAC Accelerator Seminar	March 1-2, 2018	SLAC, US	Participation to a Workshop	Scientific Community
CEA	Accelerator Industry Co-innovation workshop	Feb 6-7, 2018	Bruxelles, BE	Participation in activities organized jointly with other H2020 projects	Industry
IFJ PAN, UU, INFN, CNRS, CERN	Accelerator Industry Co-innovation workshop	Feb 6-7, 2018	Bruxelles, BE	Participation to a Workshop	Industry
UU, CEA, IFJ PAN, INFN	Big Science Business Forum	Feb 26-28, 2018	Copenhagen, DK	Exhibition	Industry / Policy makers
CEA	6 th joint workshop of the France Korea (FKPPL) and France Japan (TYL/FJPPL) International Associated Particle Physics Laboratories	May 10-12, 2017	Strasbourg, FR	Participation to a Workshop	Scientific Community / Policy makers
CEA	PIGES (Association d'Industriels Français des grands équipements scientifiques)	March 22, 2017	Paris, FR	Participation to an Event other than a Conference or a Workshop	Industry
CEA, CNRS	International Workshop on Future Linear Colliders (LCWS 2017)	Oct 23-27 - 2017	Strasbourg, FR	Participation to a Workshop	Industry / Scientific community
CEA, CNRS	TESLA Technology Collaboratio Milano 2018	Feb, 6-9, 2018	Milano, IT	Participation to a Workshop	Scientific Community
CNRS	8th Open Collaboration Meeting on Superconducting Linacs for High Power Proton Beams (SLHiPP-8)	June 12-13, 2018	Uppsala, SE	Participation to a Workshop	Scientific Community
INFN	Industry day	April 18 2017	Padova, IT	Organization of the workshop	Industry
INFN	AMICI-ARIES Mini-workshop on Intellectual properties	May 16, 2018	CERN, CH	Organization of the workshop	Scientific Community / Industry
IFJ PAN	1st Low and High Temperature Superconductors: Research and Applications	Nov 29, 2017	Krakow, PL	Participation to a Workshop	Scientific Community
IFJ PAN	2nd Low and High Temperature Superconductors: Research and Applications	March 22, 2018	Krakow, PL	Participation to a Workshop	Scientific Community
IFJ PAN	3rd Low and High Temperature Superconductors: Research and Applications	June 13, 2018	Wroclaw, PL	Participation to a Workshop	Industry
STFC	Ebeam workshop	Nov 7, 2017	Daresbury, UK	Participation to a Workshop	Scientific Community / Industry
UU	SWEbeams	March 22, 2018	Umeao, SE	Brokerage event	Scientific Community / Industry
UU	High Ion Therapy Workshop	June 19-21, 2018	Archamps, FR	Participation to a Workshop	Scientific Community / Industry

ACHIEVEMENTS

All the milestones have been achieved:

- MS1: Installation of the Advisory Group (M1)
- MS2: Website software ready (M3)
- MS3: Industry days and consultation of industry representatives completed (M4)
- MS4: Implementation of deliverable database and tools for the follow up of the milestones progress (M5)
- MS5: 1st GA and Annual project meeting (M14)


and the deliverables completed:

- D1.1: Minutes of the Kick-off Meeting (M2)
- D1.2: Definition of the participation of industry (M6)
- D1.3: Public website with searchable databases and communication tools (M12)
- D1.4: Minutes from the 1st annual and GA meetings (M16)
- D1.5: Progress (*this document*) and financial 1st reports (M20)

1.2.2. WP2 Strategy

Technological facilities and industrial companies are sharing the same concern: how to maintain the resources acquired within the previous large-scale project experiences and remain ready to contribute to the future challenging projects? These resources are: acquired know-how, qualified manpower, industrial connections and exclusive technological facilities.

The overall goal of the Work Package 2 is to collect and describe the strategic elements that allow to strengthen the partnership between the European technological facilities and industries around an identified technology infrastructure, where R&D effort on key technology areas should be performed to meet the challenging requirements of the future accelerator and SC

	FROM 01/01/2017 TO 30/06/2018	Deliverable: 1.5
		Date: 30/09/2018

magnet-based projects worldwide. This win-win partnership would allow the sustainability of the resources, the improvement of the performances/the reduction of construction and operation costs thanks to the R&D effort and the maintaining of the European industries ready to compete in the global market.

- **WP2.1 Key Technology Areas (CNRS, CEA, IFJ PAN, STFC)**

Led by CNRS, this task aims at identifying the Key Technology Areas (KTAs) in the perspective of the performances targeted by the future projects identified by the task WP2.2 (Global landscape). The state of the art of the needed technologies and the R&D effort made by accelerator and SC magnet communities have been surveyed.

The following criteria are taken into account when defining KTAs:

- being a cutting-edge technology of high interest in the accelerator or SC magnet communities,
- being widely needed for the future projects,
- presenting a high development potential allowing to meet the needs of future challenging machines,
- presenting a high development potential allowing to reduce the construction and/or operation costs of future machines,
- being critically dependent on single/very few vendor(s).

Several TIARA and EUCARD reports describing the R&D effort on several technology area have been collected and studied. KTAs update was performed regarding the needs of the new projects described in WP2.2 and the trends in technology areas. As a second step, a list of European Technological Facilities (TIs) where development on KTA can be performed, will be created. This information could be of great interest to implement a viable and sustainable cluster of TIs in partnership with industry.


The following technological areas have been identified as potential KTAs where future developments are promising:

- SRF structures (high Q0, high gradient, HTC materials, fabrication methods)
- High field SC magnets (Nb3Sn material and conductor development, HFM technologies)
- Radio Frequency Power sources (Continuous Wave RF sources, Solid State Amplifiers, High efficiency Klystrons)
- Cryogenics (High efficiency cryo-plant, cryogenic distribution, cryostat insulation)
- Normal Conducting RF cavities with high gradient (different frequency, manufacturability, conditioning...)
- Beam instrumentation (non-invasive and RF diagnostics, beam control systems)

Other technological areas like particle sources, fast electronics, vacuum and material science are under discussion. The technological roadmaps of each selected KTAs will then be described together with the corresponding Technological Facilities where these developments are currently taking place or evolving. The need for new technical platforms, or upgrades, will thus be identified.

- **WP2.2 Global Landscape (CEA, CERN, CNRS, INFN)**

Led by CEA, this task collects and analyses the agendas and the scientific roadmaps of the accelerator and SC magnet-based RIs in Europe and worldwide. The future large accelerator projects or the upgrade of existent ones have to be identified and classified by field of applications (High Energy Physics, Light Sources, Nuclear Physics, Neutron sources, Energy)

	FROM 01/01/2017 TO 30/06/2018	Deliverable: 1.5
		Date: 30/09/2018

(see Fig. 1). The timelines, the global costs (when available) and the technology breakdown of these projects are also collected and tabulated.

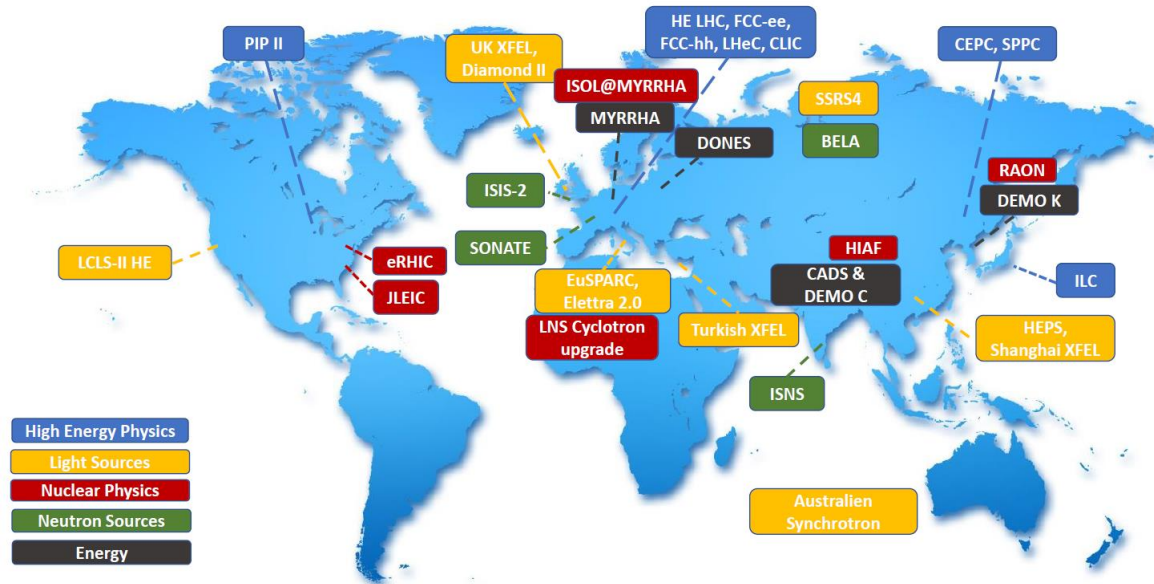


Figure 1: Global Landscape of Future accelerator Projects with their Field of Applications

Similar landscapes and roadmaps have been created for the applications of large superconducting magnets, e.g. in the fields of nuclear fusion, MRIs or particle detectors, and for medical accelerators. Results were presented during the first AMICI [Annual Meeting](#) held in Uppsala University, February 20-22, 2018.

These collection of landscapes, with their corresponding roadmap and description of the main technological components, will be transferred on the AMICI website to guarantee their efficient completion, update and dissemination.

- **WP2.3: Accelerator and SC magnet Technological Infrastructures Sustainability (UU, DESY, CEA, CERN, CNRS)**

This task is led by UU and aims at defining the conditions for the sustainability of the Technology Infrastructure. The build-up of the very large accelerator and magnet-based RIs in Europe can only be realized by the extensive involvement of the distributed network of European Technological Facilities and high-tech European Industries (see Fig.2).

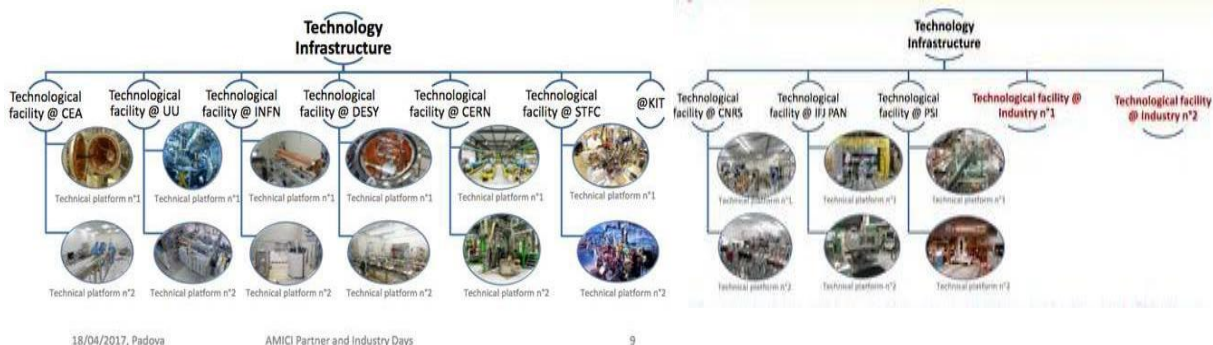



Figure 2 AMICI Technology Infrastructure defined as the Network of ten Technological Facilities and potential Industry Partners, each comprising an ensemble of distinct Technical Platforms (not all represented)

	FROM 01/01/2017 TO 30/06/2018	Deliverable: 1.5
		Date: 30/09/2018

To investigate the sustainability of this network, a census has been made among the 10 AMICI Technological Facilities requesting information about how the TFs provide components and tests of equipment for the build-up of the large Research Infrastructures and how such work is organized and financed. The current census main findings, described in detail in the WP2.3 milestone report, are summarized as follows.

Most of the current Technological Facilities in AMICI, at CEA, CERN, DESY, INFN, CNRS, STFC, University of Uppsala, IFJ PAN, PSI and KIT, were created as High Energy Physics labs with their own accelerators and HEP user communities. Modern High Energy Physics is constantly requiring larger and larger accelerators and many of the former smaller High Energy Physics accelerators have now been shut down.


The host laboratories of the very large High Energy Physics accelerators in the world do not have enough Technical Platform capacity to develop and build their own planned accelerators and the European Technological Infrastructure therefore constitutes a necessary contributor to the technical development for and build-up of the future large High Energy Physics accelerators like ILC, CLIC, FCC, CPCS, and SPPC. There are large fluctuations with time in the need for technical support for these very few and very large High Energy Physics RIs and these future RI projects cannot, therefore, at all alone provide a sufficiently continuous demand for support from the Technological Facilities for these to have a sustained activity as support laboratories.

However, the development, build-up and maintenance of the other types of very large international and national accelerator and magnet based RIs, having technical requirements similar to those of the large High Energy Physics RIs, like those for Nuclear Physics Research, Synchrotron Radiation Research, Spallation Neutron Research and Nuclear Energy Development, provide, together with the High Energy Physics Infrastructures, a more continuous demand for assistance. Even so, there may be quite some fluctuations in the need for particular technologies, causing some sustainability problems.

Conversely, the European Technology Infrastructure is necessary for the build-up and maintenance of any new large RIs in Europe, as the host laboratory for such an infrastructure will not have enough capacity and specialized knowledge and experience to alone build up the large accelerators or other large equipment. A particularly illustrative example of this is ESS for which practically all components of its RI currently are being built up and tested at a large number of European Technological Facilities.

From a first census made by the AMICI Task 2.3 among the 10 AMICI Technological Facilities (TFs) one may conclude that there are three categories of such Facilities:

1. TFs in the form of a *single laboratory with a large accelerator facility* having a wide research user community. The large accelerator facility requires technical a program of development, production and tests of new equipment to be maintained in order to keep the accelerator facility competitive. This technical program in the host lab is used to serve also *other* major RIs, which helps to maintain and develop the technical skills in the own technical programs. Labs in this category are: CERN, DESY, PSI, INFN Frascati, STFC-RAL.
2. TFs in the form of *national clusters of a number of smaller laboratories* which have smaller accelerator facilities mostly for accelerator and magnet technology developments and in some cases for research and test beams which also have, taken together a major program of development, production and tests of equipment for major RIs. Labs in this category are INFN, STFC, CNRS-IN2P3.
3. TFs in the form of a *single laboratory with no major research accelerator* but a major program

	FROM 01/01/2017 TO 30/06/2018	Deliverable: 1.5
		Date: 30/09/2018

of development, production and tests of equipment for RIs. Labs in this category are CEA, FREIA and IFJ PAN.

These three categories have different sustainability boundary conditions. One clear tendency is that the Technological Facilities having an accelerator RI with an associated scientific user community have less problems with sustainability owing to the support to the Facility provided by its accelerator user community

The census also gave a picture of how the co-operation between the Technological Facilities and the RIs are regulated. It appears essential for the future of European fundamental science, as well as for the development of European high-tech industry, that the new and important role played by the European Technological Facilities be understood by the national science and technology funding sources in Europe such that the sustainability of the TFs be guaranteed.

It is both time-consuming, risky and costly for an SME to spend the time and the resources needed for the exploration of the possibility and usefulness of developing a brand-new technology proposed by a RI. Because of this, it is necessary to involve local scientists and engineers that have experience of working with the specific type of RI, having at their disposal an adequately equipped Technological Facility for developing and testing the new technology and operating with the SME as a partner and as interface to the RI.

The Technological Facility offering this type of service must have its basic operations costs covered by public funding – if it were to have to ask the SME to cover the costs for all services offered in the co-operation, this again would normally represent too big a cost and risk for the SME, and Technology Facility could not sustain its activity if the co-operation would be required to build on completely commercial conditions.

The motivation for providing the required public support to the TFs is thus that:

- TFs have nowadays become vital actors for the advancement of fundamental research in Europe based on large RIs and
- TFs make it possible for modern European SMEs to meet the demand from the RIs to develop qualitatively new technology that very soon will find its way out in Society.

ACHIEVEMENTS

All the milestones have been achieved:

- MS8: Updating of Key Technologies Areas (M12)
- MS9: Collections of the scientific roadmaps (M14)
- MS10: Intermediate report on sustainability (M21)


and no deliverables was due during that period.

1.2.3. WP3 Coordination

• Scope and brief description

The overall goal of Work Package 3 is to define the conditions of the coordination of Technological Infrastructures (TI) in the area of accelerators and superconducting magnets in order

- to harmonize their operation and
- to increase their efficiency,
- to adapt to the development of present and future European RIs, and

	FROM 01/01/2017 TO 30/06/2018	Deliverable: 1.5
		Date: 30/09/2018

- to establish a co-innovation platform with industry.

Eligibility criteria for the participation and networking of TIs are investigated in detail, in order to finally propose an appropriate coordination model.

It is anticipated that cooperation between existing major and active TIs can be used for the formation of a core group, with the incorporation of flexible links to smaller TIs as being an essential mechanism for improving innovation and support to smaller research centres and also universities.

Possible links to industrial partners will also be identified with the aim to fostering innovation and competitiveness. TIs can foster innovation potential through cooperation, but also by initiating collaboration to achieve shared objectives. This targeted network can support temporary exchange of highly qualified personnel; as innovative expert teams should have access to dedicated TIs for education and training purposes.

The elaboration of a consortium agreement reflecting the goals of the overall Cooperation program will be sought within AMICI.

- **Activities of Task 3.1**

Under the lead of CEA, this task investigates, identifies and appropriately summarizes the eligibility criteria for the envisaged network. This task elaborates and defines the conditions of eligibility for an accelerator or superconducting magnet European infrastructure to be eligible in the core group of large European Technological Infrastructures. The selection should be based on technical spread, accessibility, innovation and industrial opportunity criteria to avoid clustering a too large number accelerator and magnet based facilities, and to allow for strong integration and impact of TI activities.

- **Activities of Task 3.2**

Under the lead of IFJ Cracow, this task is developing a coordination model for the use of the considered major TIs, including defining standards for the use by external users. Coordination is seen as providing assistance in searching for R&D partners, supporting the selection of objectives (outlining trends, future tasks), and fostering the definition of standards commonly used in the accelerator community.


- **Activities of Task 3.3**

All AMICI core-group members base their actual cooperation or project driven collaboration on a variety of written agreements or contracts. Since most activities are temporarily funded, sustainability is not always guaranteed. Under the lead of DESY, this task studies existing general collaboration agreements and uses the expertise of the involved legal experts with the goal to harmonize such agreements to ease the later definition of attachments dealing with technical developments.

Innovation brings technology transfer, and the latter requires license agreements – either with license fees or royalty arrangements. In many cases concerted actions would be preferable and definitely help with respect to the AMICI goals. Task WP3.3 will study the path from successful cooperation to collaboration. Existing bi- or multilateral agreements between AMICI members and with other partners are analyzed.

ACHIEVEMENTS

All the milestones have been achieved:

	FROM 01/01/2017 TO 30/06/2018	Deliverable: 1.5
		Date: 30/09/2018

- MS11: First version of the report on eligibility criteria (M9)
- MS12: First version of the report on networking and coordination model (M16)
- MS13: Collection and analysis of bi- or multilateral agreements between AMICI members and with other partners (M21)

and the deliverables completed:

- D1.1: Report defining the eligibility criteria for accessing to the core group of large TIs (M21)

1.2.4. WP4 Innovation

- ***Scope and brief description***

The overall objective of the innovation work package is to promote the potential applications of accelerator and magnet technologies to European businesses that have the potential to apply their expertise to societal applications through successful engagement with Technological Infrastructures. This work package is charged with analysing the current relationship between Technological Infrastructures and Industry, and exploring how existing and future Technological Infrastructure developments can strengthen those links going forward. This process supports innovation, through the development and transfer of technologies, processes and skills into accelerator-related developments and societal applications, whilst also strengthening a vibrant and diverse supply chain which can best support the future technology requirements of the next generation of research particle accelerators.


At its core, this workpackage seeks to understand Industry's needs and requirements, and to inform potential innovation models to best harness future developments within the TIs. Central to this is gathering accurate information to fully understand the existing relationships between TIs and Industry. It was determined in the formation of the AMICI project that market surveys should be conducted across a wide range of businesses throughout Europe, both large and small, and with varying degrees of reliance on the national-scale research institute market for their income.

- ***Activities of Task 4.1***

STFC have been leading work package task 4.1, concerning the interaction between TI and Industry in the field of accelerator technologies and systems. Based on previous experience with market surveys, STFC have chosen to primarily conduct this conversion through the services of an external subcontractor. STFC have managed an open tendering process, in accordance with UK Government procurement legislation, available to bidders across Europe. Qi3 were selected through this process in March 2018, meeting the required milestone for selection of the subcontractor (MS14). STFC and Qi3 have collaborated on developing the specification and scope of the surveying process and data collection commenced during summer 2018 with partner organisations and industry.

- ***Activities of Task 4.2***

Superconducting magnet systems, with their established links into societal applications in areas such as healthcare, were seen as a priority development area and therefore allocated a separate work package task (WP4.2), led by CEA. CEA have worked closely with INFN to provide coordinated data collection regarding magnet supplier's current interaction and future requirements of Technological Infrastructures through means of web-based questionnaire tools. Data collection from Industry commenced in March 2018.

	FROM 01/01/2017 TO 30/06/2018	Deliverable: 1.5
		Date: 30/09/2018

- **Activities of Task 4.3**

INFN are leading task WP4.3 which is investigating real and perceived barriers to Industry's effective engagement with Technological infrastructures. A joint CEA and INFN questionnaire was developed and trialled with companies who had indicated their wish to be directly involved in the process at the AMICI Industry Day, Padova. Data collection commenced in March 2018, in partnership with CEA to avoid duplication of industrial contacts, and a series of one-to-one meetings are planned by INFN to further support the data collection. Early analysis identified common issues such as intellectual property rights, prompting a joint Horizon 2020 AMICI-ARIES workshop to be held in May 2018.

- **Other beneficiaries**

The AMICI partners have provided input and feedback to the market survey activities. CERN have conducted additional internal discussions regarding Technological Infrastructure/Industry interactions and processes, and the merits of this additional data has prompted the process to be replicated across the other AMICI partners through summer 2018.

Once data collection has been completed across the three work packages in Q3 2018, the results will be analysed in detail tasks to inform discussions on the most appropriate innovation model(s) and optimised processes to allow seamless, mutually-beneficial interaction between Technological Infrastructures and Industry.

ACHIEVEMENTS

All the milestones have been achieved:


- MS14: Third party selected for survey on accelerator technologies (M15)
 - MS15: Interim report on survey results in the field of magnet technologies (M15)
- and no deliverables was due during that period.

1.2.5. WP5 Industrialization

- **Scope and brief description**

The scope of WP5 is to sensitize and train the industrial companies in the needs, the know-hows, the techniques, the methods and the quality standards of laboratories developing accelerator and superconducting magnet technologies in their Technological Infrastructures. The WP5 is organized in four Tasks:

- Task 5.1- Professional training and apprenticeship (Lead partner CEA. Other participants: DESY, INFN). This task aims at promoting professional skills training and cross improvement between research laboratories and industry.
- Task 5.2 - Harmonization- Material and Components Reference (Lead partner CNRS. Other participants: IFJ-PAN). The main goal of this task is to set the basis for a common knowledge, background and use among Technological Infrastructures and related laboratories and industries in relation to material and components involved in accelerator and large superconducting magnets.
- Task 5.3 - Harmonisation - Standardisation Activities on Safety of Cryogenic Equipment (Lead partner KIT. Other participants: CEA). Under the EU regulations, this task organizes the exchange of knowledge and procedures in order to obtain a common methodology used by labs and industry for the design and fabrication of cryogenic equipment.

	FROM 01/01/2017 TO 30/06/2018	Deliverable: 1.5
		Date: 30/09/2018

- Task 5.4 - Requirements and conditions for developing prototyping in the industry (Lead partner INFN). The aim of this task is the definition, in cooperation with interested companies, of the basic requirements and conditions that can make it attractive, feasible and effective to engage companies in developing prototypes of accelerator components (or accelerator significant parts) or large superconducting magnets.

- **Industry involvement in WP5 activities**


As the WP5 activities are based on a tight relations with industry, it was necessary to set-up a collaboration frame with the companies working in the field of accelerator and superconducting magnets. This need is in fact common to the whole AMICI project and constitutes the main objective of the Work Package 1 Task 2 (*Organization of the participation of Industry*). During the first three months of the project a specific workshop was organized: the ‘AMICI Partner and Industry Days for Scientific Technology Infrastructure’ meeting, which took place in Padua, on April 18-19 2017. In this meeting the goal of AMICI project was presented to the participating companies, focusing their attention in particular on the Tasks and activities in which industry is going to play an important role, and to collect their comments, suggestions and expressions of interest in order to organize in the most effective way their involvement. Regarding the industry interest for the WP5 activities, from 10 to 17 companies expressed their interest in being informed of the activities of the different WP5 Tasks and from 2 to 6 companies were willing to participate to WP5 working groups studying the problems and proposing solutions.

- **Activities of Task 5.1**

After the Industry day in Padua, four companies expressed interest in participating in WP5.1 working group: Elytt, 40-30, Alsyom and OCEM. With these companies a series of meeting took place in 2017 in order to investigate how they organize the training of their employees, how it is financed and what could be their need. An important step has been a meeting at CEA held on December 19th 2017 with the participation of WP5.1 working group and representatives of other WP5 Tasks (T5.2 and T5.4). In this meeting a report was given about the 2017 activities and focused on: 1) Survey of the practice in RIs in training and apprenticeship, 2) Survey of the practice in Industry in training and apprenticeship. From the discussion among the working group, it appeared the need to move to the following two steps: 1) To define a list of skills that companies should have or should develop in the field of accelerators and magnets, 2) To make a survey of training/learning needed by industry. At the present time it is under investigation both the possibility to create a « fund » with contribution of interested companies and practice the training and the possibility to create a consortium of infrastructures and companies in order to train/learn when contracts for next accelerators or magnets. The working group activities required more time than expected, essentially due to a workshop with industry representatives which had to be rescheduled. This led to a delay in the Milestone 19 ‘Preliminary report on the required conditions for apprenticeship programs in TI’ and MS 20 ‘Preliminary report on the required conditions for apprenticeships program in industries’ which moved from April 2018 to December 2018.

- **Activities of Task 5.2**

As for Task 5.1 a working group was set-up after the Industry Day. In this case the working group involves TI representative (CNRS and CEA) and industries (Heraeus, Bilfinger, Ocem, Mecachrome, Antec, Saes). Since the beginning it has been decided to follow an approach for

	FROM 01/01/2017 TO 30/06/2018	Deliverable: 1.5
		Date: 30/09/2018

the database structure based on functionality of main components of an accelerator. At the same time an investigation of the existing databases in the TI of AMICI took place. An important meeting has been held at CNRS in Orsay on May 30th 2018 with the aim to discuss and validate the proposed structure of DataBase and the software choice for the development of AMICI Data base B dedicated to Accelerators and Magnets.

- **Activities of Task 5.3**

The working group of this task includes experts from CEA, CERN and KIT, who are also participating in the European Committee for Standardization (CEN), working group CEN/TC 268/WG6 – Specific helium technology applications. The inauguration of CEN/TC 268/WG6 took place at the DIN secretariat in Berlin on July 25, 2017 with the participation 15 experts from 5 countries. The 2nd meeting of the working group took place at KIT, Karlsruhe on October 19, 2017. This meeting was attended by experts from both industry and research labs, and progress was achieved on the structure and the content of the new Standard. The new Standard will be titled “Helium cryostats – Protection against excessive pressure”. The report about “List of safety scenarios in helium cryostats” (Milestone 18) was issued on December 12th 2017.

- **Activities of Task 5.4**

After the Industry Day Presently six companies were actively working with T5.4: ASG Superconductors (Italy), ANTEC Magnets, S.L.U. (Spain), Babcock Noell GmbH (Germany), ELYTT (Spain), Zanon (Italy), Sigmaphi (France). As first step a questionnaire was sent to these companies for defining advantages and disadvantages when dealing with the TI-Industry collaboration in prototype developments. The industrial partners were asked to comment the different scenarios by assigning a rank to the entity of the advantage or disadvantage (High, Medium, Low and Negligible) and possibly commenting and adding further pros or cons. The construction of prototype with industry was deeply debated in two meetings of the T5.4 Working Group in Milano (January 25th 2018) and Bruxelles (February 6th 2018), this latter meeting being a satellite meeting of the “Accelerator-Industry Co-Innovation Workshop” (Bruxelles 6-7 February 2018). Among the most interesting aspects emerged in these meeting it is remarkable a subsidiary principle strongly supported by industries based on the criterion that a TI/RI should develop prototypes in its facilities only in case industry is not available or cannot do. A second very important aspect is related to the management of the intellectual properties in the collaborating activities between Research and Technical Infrastructure and Industry. This aspect was discussed in a larger frame in a dedicate workshop organized jointly by AMICI and ARIES at CERN on May 16th (<https://indico.cern.ch/event/723985/>).


ACHIEVEMENTS

One milestone has been achieved:

- MS18: List of safety scenarios in liquid helium cryostats (M12) and no deliverables was due during that period.

1.3. IMPACT

The information on the expected impacts of AMICI given in section 2.1 of the DoA is still relevant. However, AMICI will only propose a model of a coordinated ecosystem of Technological Infrastructures in the field of accelerators and SC magnets, associating all the

	<p align="center">FROM 01/01/2017 TO 30/06/2018</p>	<p align="right">Deliverable: 1.5</p>
		<p align="right">Date: 30/09/2018</p>

key players from universities to industry and SMEs, with actions allowing the European industry:

- to have a clear information about the strategic science and technology roadmaps for the future accelerator and superconducting magnet-based RIs worldwide and therefore be in a strong position to compete on the global market,
- to have a simplified and supported access to the most adequate technical platforms thanks to the stronger and optimized integration model established among the large existing technological facilities,
- to benefit from the integrated ecosystem that will foster innovation based on cutting-edge tools and developments allowing them to enhance their visibility and competitiveness in new markets,
- to overcome their technology development barriers and further develop commercial opportunities within the RIs and wider societal markets,
- to profit from the information exchange, definition of harmonized and standardized procedures and access to databases, which should lead to cost reduction in the long term.

The overall expected impact, i.e. ensuring that Europe in the future will continue to be able to develop cutting-edge technologies for accelerators and SC magnets and its industry to build highly competitive accelerator-based RIs in Europe and in the rest of the world, can be reached only if the coordinated European Technology Infrastructure is created and the proposed actions funded.

2. UPDATE OF THE PLAN FOR EXPLOITATION AND DISSEMINATION OF RESULT (IF APPLICABLE)

The plan for exploitation and dissemination of results does not need to be updated for the first reporting period of AMICI project.

3. UPDATE OF THE DATA MANAGEMENT PLAN (IF APPLICABLE)

Not applicable: AMICI does not generate research data.

4. FOLLOW-UP OF RECOMMENDATIONS AND COMMENTS FROM PREVIOUS REVIEW(S) (IF APPLICABLE)


Not applicable.

5. DEVIATIONS FROM ANNEX 1 AND ANNEX 2 (IF APPLICABLE)

5.1. TASKS

5.1.1. Milestones

The AMICI Milestones are described in the Table 1 below. Most of Milestones have been reached sometimes with a small delay not affecting the general progression of the work. Only MS19 and MS20 which belong to Work Package 5, Task 5.1 have not yet been achieved. Two main reasons justify this delay: the last workshop organized for at CEA Saclay received a too small participation from Industry and several questions relevant to Apprenticeship and Training

	FROM 01/01/2017 TO 30/06/2018	Deliverable: 1.5
		Date: 30/09/2018

have been included in the Market Survey widely organized by WP4 and currently under analysis. This input will soon be available. Both Milestones have been rescheduled for Month 24 (December 2018).

Ref.	N°	Milestone Name	Milestone Type	WP	Delivered by Contractor	Initially foreseen (in month)	Achieved (in month)	Planned (in month)
MS1	1	Installation of the Advisory Group	Meeting	WP1	CEA	1	1	
MS2	2	Website software ready	Other	WP1	IFJ PAN	2	2	
MS3	3	Industry days and consultation of industry representatives completed	Meeting	WP1	INFN	3	3	
MS4	4	Implementation of deliverable database and tools for the follow up of the milestones progress	Other	WP1	IFJ PAN	5	5	
MS5	5	1st GA and Annual project meetings	Meeting	WP1	CEA	11	14	
MS6	6	2nd GA and Annual project meetings	Meeting	WP1	CEA	23		23
MS7	7	3rd GA and Annual project meetings	Meeting	WP1	CEA	29		29
MS8	8	Updating of KTA		WP2	CNRS	9	12	
MS9	9	Collection of the scientific Roadmaps	Other	WP2	CEA	12	14	
MS10	10	Intermediate report on sustainability	Report	WP2	UU	18	21	
MS11	11	First version of the report on eligibility criteria	Report	WP3	CEA	9	9	
MS12	12	First version of the report on Networking and Coordination Model	Report	WP3	IFJ PAN	12	16	
MS13	13	Collection and analysis of existing bi- or multilateral agreements between AMICI members and with other partners		WP3	DESY	18	21	
MS14	14	3rd Party selected for survey on accelerator technologies		WP4	STFC	15	15	
MS15	15	Interim report on survey results in the field of SC Magnet Technologies	Report	WP4	CEA	15	15	
MS16	16	Initial analysis of acquired data on good practices and identification of actions		WP4	INFN	26		26
MS17	17	Survey on accelerator technologies received from 3rd party	Report	WP4	STFC	27		27
MS18	18	List of safety scenarios in liquid helium cryostats	Report	WP5	KIT	12	12	
MS19	19	Preliminary report on the required conditions for apprenticeships program in TI	Report	WP5	CEA	16		24
MS20	20	Preliminary report on the required conditions for apprenticeships program in industries	Report	WP5	CEA	18		24
MS21	21	Preliminary conclusions of the working group on prototyping issues	Report	WP5	INFN	24		24

Table 1: AMICI Milestones (achieved Milestones dates are in green)

5.1.2. Overview of Deliverables

The AMICI deliverables are described in the Table 2 below, together with their expected dates, delivery dates and responsible beneficiary. All deliverables due during the first Reporting Period have been delivered and posted on the EC Portal.



FROM 01/01/2017 TO 30/06/2018

Deliverable: 1.5

Date: 30/09/2018

Ref.	N°	Deliverable Name	Deliverable Type	WP	Delivered by Contractor	Initially foreseen (in month)	Achieved (in month)	Planned (in month)
D1.1	1	Minutes of the Kick-off Meeting	Report	WP1	CEA	2	2	
D1.2	2	Definition of the participation of industry	Report	WP1	INFN	4	4	
D1.3	3	Public website with searchable databases and communication tools	Other	WP1	IFJ-PAN	11	11	
D1.4	4	Minutes from the 1st annual and GA meetings	Report	WP1	CEA	12	15	
D1.5	5	Progress and financial 1st reports	Report	WP1	CEA	18	21	
D1.6	6	European Forum on accelerators and SC magnets Technological Infrastructures	Other	WP1	INFN	24		24
D1.7	7	Report on dissemination and data management	Report	WP1	IFJ-PAN	30		30
D1.8	8	Minutes from the 2nd annual and GA meetings	Report	WP1	CEA	24		24
D1.9	9	Minutes from the 3rd annual and GA meetings	Report	WP1	CEA	30		30
D1.10	10	Progress and financial 2nd reports	Report	WP1	CEA	30		30
D2.1	11	Report on Key Technological Areas survey and prospective outlook	Report	WP2	CNRS	24		24
D2.2	12	Report on the Technological Roadmaps for the different KTA	Report	WP2	CEA	27		27
D2.3	13	Report on propositions to guarantee the long term sustainability of TIs	Report	WP2	UU	30		30
D3.1	14	Report defining the eligibility criteria for accessing to the core group of large TIs	Report	WP3	CEA	18	21	
D3.2	15	Report on the networking and coordination model	Report	WP3	IFJ PAN	30		30
D3.3	16	Report about the proposed model of collaboration agreement	Report	WP3	DESY	30		30
D4.1	17	Report on accelerator market study	Report	WP4	STFC	30		30
D4.2	18	Report on SC magnet market study	Report	WP4	CEA	30		30
D4.3	19	Report on best practice collaboration between industry and technology	Report	WP4	INFN	30		30
D5.1	20	Definition of the possible structure and content of a database for materials and components	Report	WP5	CNRS	26		26
D5.2	21	Final report on the required conditions for apprenticeships program in TI	Report	WP5	CEA	28		28
D5.3	22	General harmonised guidelines for the safety of cryogenic equipment	Report	WP5	KIT	28		28
D5.4	23	Final report on the required conditions for apprenticeships program in industries	Report	WP5	INFN	30		30
D5.5	24	Final report on conditions for developing prototypes in industry	Report	WP5	INFN	30		30

Tableau 2: AMICI Deliverables (achieved Deliverables dates are in green)

5.2. USE OF RESOURCES

There is no deviation between the actual and the planned use of resources.