FuSuMaTech

Future Superconducting Magnet Technology

H2020-FETOPEN-2016-2017/H2020-FETOPEN-3-2017

Grant Agreement Number n° 766974

DELIVERABLE D6.1

Public Project Website and Visual Identity of FuSuMaTech Phase 1

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Date and visas	31/1/2018	05/02/2018		05/02/2018

HISTORY OF CHANGES					
Version	Publication date	Change	Edited by	Reviewed by	Approved by
1.0	31/01/2018	-	Han Dols		

PROJECT DELIVERABLE INFORMATION SHEET		
FuSuMaTech Project	Project Reference	N° 766974
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	Project website	http://fusumatech.web.cern.ch
	Deliverable No	6.1
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	EC Project Officer	Adriana GODEANU-METZ

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1. PROOF OF DELIVERY

As foreseen in the Grant Agreement WP6 team finished constructing a website for FuSuMaTech and created a visual identiy. The website can be found at http://fusumatech.web.cern.ch. All partners are asked to share the link to the web site in their communication and own website as part of FuSuMaTech joint dissemination responsibilities.

The structure of the website is based 100% on the text and visuals from the agreed FuSuMaTech proposal. This include a reference to Partner institute/company in the partner page (see http://fusumatech.web.cern.ch/partners).

Website structure and content is defined and built for :

- Target group: SC/magnet scientist & engineers, EU stakeholders, potential new partners.

Website will content the following tab:

- About | Background | Objectives | Implementation | Partners

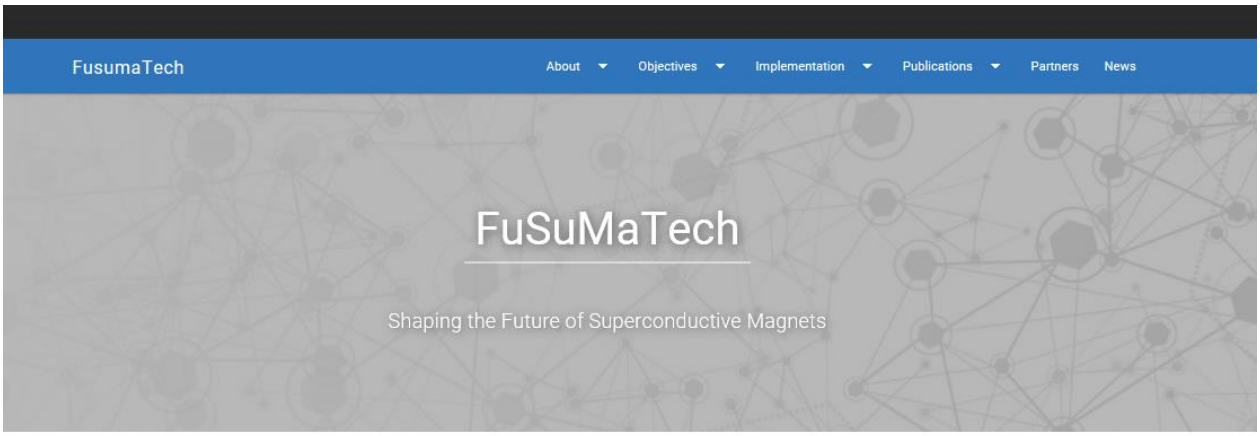
Website will be a major tool for dissemination by:

- Visibility and link via CERN KT website
- Links from partners (from your websites!)
- Reach out via Linkedin Groups and CERN KT channels
- Push via personal social media channels of participants

The following pages will contain screenshots of the website and the visual identity. Note that not all pages have been included and that the website also contains many interactive elements which are not possible to demonstrate on paper. For the full website please visit http://fusumatech.web.cern.

The visual identity:

The website:



The CERN's projects, HL-LHC and FCC, will create a big push in the state of the art of High-Field Superconducting magnets in the ten coming years. The performance of superconducting materials such as Nb3Sn and HTS will be developed to yield higher performance at lower costs and the construction materials and techniques will be advanced.

At the same time, in the context of Energy's savings, Industry is experiencing a renewed interest in the domain of industrial superconductivity with fault current limiters, wind generators, electric energy storage, etc. Besides, Medical Research shows a strong interest in High-Field MRI, especially for the brain observation. Considering the social impact of the investment of the HL-LHC project and FCC study, CERN and CEA have established a Working Group on Future Superconducting Magnet Technology (FuSuMaTech).

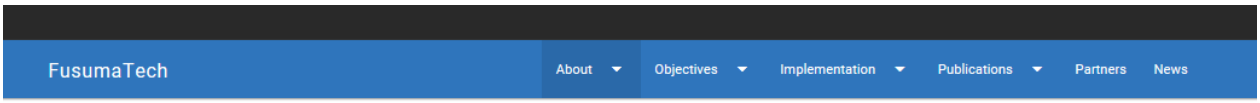
> *The FuSuMatech Initiative is a dedicated and large scale silo breaking programme which will create a sustainable European Cluster in applied Superconductivity, initiated by 12 academic and industrial partners. It will enlarge the innovative potential especially in High Field NMR and MRI, opening future breakthroughs in the brain observation*

The Working Group has explored a large spectrum of possible synergies with Industry, and has proposed a set of relevant R&D&I projects to be conducted between Academia and Industry. To keep the leading position of Europe in the domain, the most efficient way is to support joint activities of Industry and academic partners on the common concerns in view of overcoming the technological barriers.

FuSuMaTech in two phases

The FuSuMaTech Initiative consists out of two phases. Phase 1 is a preliminary stage within the global FuSuMaTech Initiative. As an overall ambition it intends to secure the future operations of a sustainable European Cluster. FuSuMaTech Phase 1 will consist of preparing the administrative and legal conditions according to which the European Cluster will operate. Also it will identifying appropriate instruments and funding schemes for the future R&D&I activities providing detailed descriptions of generic R&D&I actions and of the technology pilots.

After the completion of FuSuMaTech Phase 1, the European Cluster will exist and will make use of all the other EU programmes and their instruments. It will be the Phase 2 of the FuSuMaTech Initiative.



Background

Particle physics as innovation driver

Particle physics is pushing the exploration of our universe to the extreme limit of the infinitely small scale. To achieve this goal, which is one of the most challenging of the present natural science, research physicists and engineers imagine fabulous new machines at the forefront and even beyond the state of the art of technology. At the beginning of a new project the challenges often looks impossible to overcome. But over the years, the scientists have demonstrated that they know how to transform science-fiction instruments into reality! We only have to look at the incredible 27km-long superconducting accelerator the LHC and its monster experiments ATLAS and CMS. And so particle physics has demonstrated to be an incredible innovation booster.

> *The key to make the impossible possible: the best physicist and engineers of the academic community working hands in hands with industry*

This boost is not only beneficial to particle physics but to the whole society! Indeed, since it is a major boost of technology and since technology has many applications this boost has demonstrated to have a direct impact on many domains of research, on societal challenges, on the economy and even on our everyday life.

Superconductive magnets to peek into the brain

Another great example is superconductivity. We can evaluate that the development of superconducting magnets for particle physics has boosted by at least 5 years the development of this technology thus bringing MRI diagnostic 5 years earlier in hospitals. Knowing the huge size of the medical market and the number of people saved every year thanks to the MRI diagnostics we can easily understand the economical and societal impact of these 5 years' boost.

> *The future of high-field magnets have an enormous potential for neuro-imaging, high energy physics and industry alike*

Superconducting technologies are now going through a second revolution with the R&D on novel materials with fantastic properties allowing higher fields, higher temperatures and innovative designs: the superconductivity 2.0. At the same time particle physics is working on even more challenging new projects aiming at world-record luminosity and energies.

The needed breakthrough

Our capability to actually build magnets with world-record characteristic and in particular magnetic field transforming the superconducting revolution 2.0 into reality: that is the breakthrough we target. This new strong boost of technology can be used to develop magnets with incredible properties allowing gigantic leap in brain imaging or high field physics. The super conducting revolution 2.0 can also transform every-day life through the development of new medical diagnostic or therapy or through its impact on the energy management with the production, the transport and the storage of energy.

Over the last 25 years, the LHC has been a key driver in the development of superconducting magnets, one of the most influential technologies to come out of accelerator R&D&I. The applications of superconducting magnets extend well beyond the domain of High Energy Physics, and are key for medical applications and energy management (production, transport and storage). Future technological advances in high-field magnets will benefit both future CERN projects like the HL-LHC project and FCC study, and will also find application in imaging the human brain as well as serve the global energy savings.

Below more background related to the application of superconductivity in High Energy Physics and Neuro Imaging.

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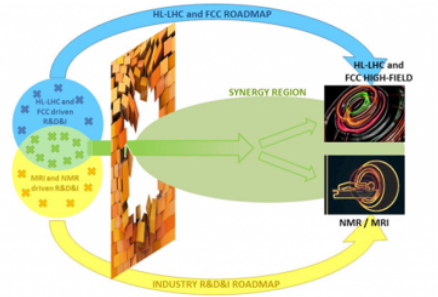
Objectives

In order to achieve its overall ambition, FuSuMaTech Phase 1 addresses 4 main objectives which are further detailed hereafter. Per objective, more details can be found by clicking on the boxes below.

Objective 1: Moving towards a FuSuMaTech European Cluster

1. Identify the ecosystems and the synergies between on the one hand the areas of MRI and NMR in the advanced medical imaging sector as well as other industrial applications in the sectors of energy transmission (power networks and superconducting Wind turbine) and on the other hand the HL-LHC and FCC investments in the technology domains of superconducting magnets.
2. Develop the "synergy region" i.e. close relationships between researchers and industrial stakeholders involved in the above mentioned domains so as to exchange information and transfer knowledge that will help tackle future innovation challenges.
3. Establish an R&D&I European ecosystem gathering consolidated as well as new actors such as young researchers, entrepreneurs and high-tech SMEs from the above mentioned domains, especially energy savings and medical applications, and broadening the engagement of researchers and industrial stakeholders.



Objective 2: Building the FuSuMaTech Roadmapping

Objective 3: Defining and Preparing Generic R&D&I Actions

Objective 4: Defining and Preparing Pilot Actions

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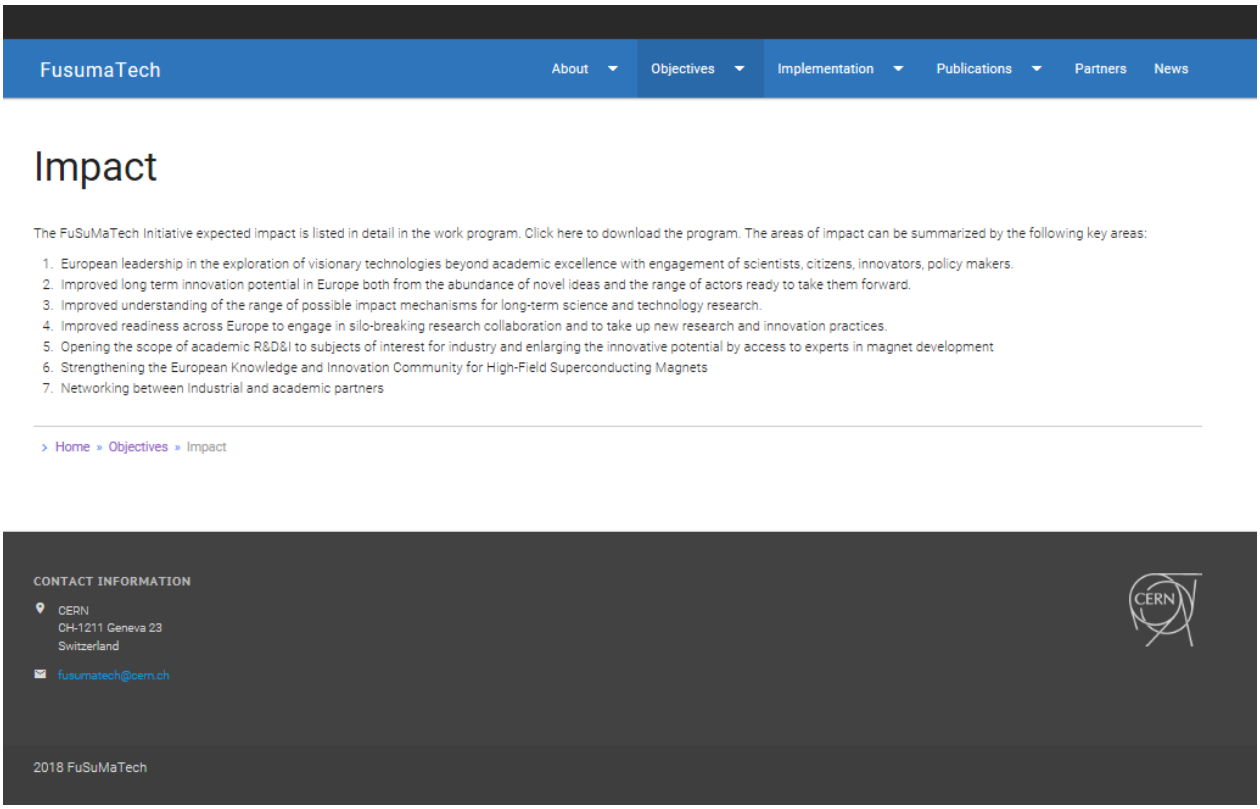
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Impact
The FuSuMaTech Initiative expected impact is listed in detail in the work program. Click here to download the program. The areas of impact can be summarized by the following key areas:
1. European leadership in the exploration of visionary technologies beyond academic excellence with engagement of scientists, citizens, innovators, policy makers.
2. Improved long term innovation potential in Europe both from the abundance of novel ideas and the range of actors ready to take them forward.
3. Improved understanding of the range of possible impact mechanisms for long-term science and technology research.
4. Improved readiness across Europe to engage in silo-breaking research collaboration and to take up new research and innovation practices.
5. Opening the scope of academic R&D&I to subjects of interest for industry and enlarging the innovative potential by access to experts in magnet development
6. Strengthening the European Knowledge and Innovation Community for High-Field Superconducting Magnets
7. Networking between Industrial and academic partners
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Implementation

Opening doors between high energy physics and industry

Superconducting magnets for High-Energy Physics are in a decisive period of technology development and will be facing unprecedented challenges in the ten coming years. A roadmap for the magnets in High Energy Physics is established, but this roadmap poses a range of technological barriers which will need to be overcome. Similarly, the industrial roadmap of superconductivity applications is also facing challenges, especially in the high-field applications (MRI and NMR) as well as in the in the energy sector (fusion, wind turbine).

> *In Japanese tradition, fusuma (襖) are panels which can slide from side to side and act as doors. The FuSuMaTech Initiative aims to open the doors between the technical worlds of high energy physics and industry.*

The basic principle of the FuSuMaTech Initiative is the ascertainment that, among the R&D&I subjects identified on one hand under the magnets for High Energy Physics technology and the industrial magnet technology, there are a lot of common subjects. These subjects are very challenging and the most efficient way for Europe to keep its global leadership and to overcome the challenges is to support common activities gathering Industry and academic partners on these common subjects. The FuSuMaTech Working Group, established in January 2015 by CERN and CEA, has clearly pre-selected a set of common R&D&I subjects. As the R&D&I activities should not only rely on academic methods, the R&D&I subjects have been classified in two categories:

1. Generic R&D&I
2. Pilots and technology demonstrators

The FuSuMaTech Initiative is firmly placed under the umbrella of the large CERN development plans for HL-LHC and FCC. The two development plans for HL-LHC project and FCC study will deploy a lot of specific R&D&I programmes in the ten coming years and will result in the realisation of numerous prototypes and several sets of serial magnets to be installed in real accelerators, based on a frontier edge technology.

FuSuMaTech Phase 1

Europe has a recognised leadership in the domain of superconducting magnet technology and the FuSuMaTech Initiative is clearly placed in this industrial context. The European companies involved in the production of superconducting magnets are key players on a global scale. The FuSuMaTech Initiative is positioned at the crossroad of the HL-LHC roadmap and of the industrial roadmap with applications in for example MRI, NMR and transport of energy.

The **FuSuMaTech Phase 1** is the first step of the FuSuMaTech Initiative. It will consist in preparing:

1. The administrative and legal conditions;
2. The detailed description of generic R&D&I actions and of the Technology demonstrators;
3. The funding scheme for the future actions.

In this way, the FuSuMaTech Initiative will solve a set of generic R&D&I questions that are common to these two worlds and will create the conditions for development in common of several technology demonstrators.

Looking ahead

The FuSuMaTech Initiative is placed on a long term time line and is a dedicated and large scale silo breaking programme. The FuSuMaTech Phase 1 will facilitate the conditions for the resolution of technical issues and the emergence of innovative magnet designs. Once the FuSuMaTech Phase 1 is completed after 18 months, the actors from Industry and Academia will be ready to start the real implementation of the R&D&I actions and technology demonstrators and the FuSuMatech European Cluster for Superconducting Magnet Technology will be born.

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Work Packages

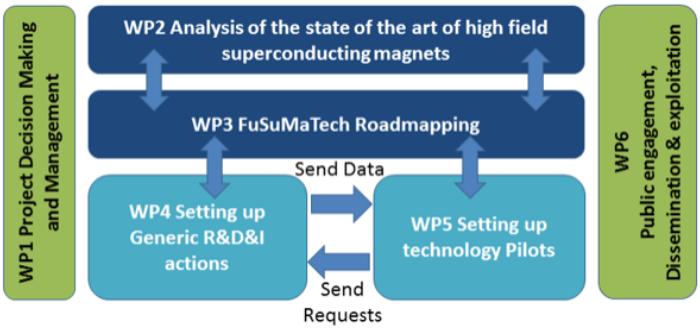
The work to be performed in FuSuMaTech Phase 1 is distributed over 6 Workpackages, each of them being divided into tasks. According to the task definition, suitable deliverables are attached to the Workpackages. Milestones are defined for each workpackage and defined as the months due after project initiation. So M3 means the deliverable is due 3 months after project start. WP1 'Strategic decision making and Management' defines the role of the PCO (Project Coordinator) and PM (Project Manager) as well as the attributions of the General Assembly and Project Steering Committee of the 12 partners and of the Scientific and Technical Committee.

Based on the fundamentals of WP2, WP3 is tracing the roadmap of FuSuMaTech Phase 1 based on at least ten actions of Generic R&D&I and technology demonstrators to be developed in the following 5 or 10 years. The analysis of the "state of the art" in WP2 should be considered as a way to go forward and prepare a big step forward in magnet technology thanks to the FuSuMaTech roadmapping developed in WP3.

WP4 Setting up Generic R&D&I actions and WP5 Setting up technology Pilots are the heart of the FuSuMaTech Phase 1 action as the concept and methodology of FuSuMaTech Phase 1 consist of taking advantage of the existing synergies to implement the win-win strategy by direct and concrete preparation of real "case studies". The 10 "case studies" will be validated at the beginning of the execution of FuSuMaTech Phase 1 and will rely on numerous mutual interactions between the consortium members.

Public engagement, Dissemination, exploitation, communication, and IP Management issues are, among others, the central topics of WP6. WP6 will produce the legal tools of IP management necessary to go further in the real implementation of R&D actions. The numerous interactions with the practical case studies addressed in WP4 and WP5 will dramatically help the elaboration of these legal tools.

The diagram below shows the relations between work packages. More details can be found below.

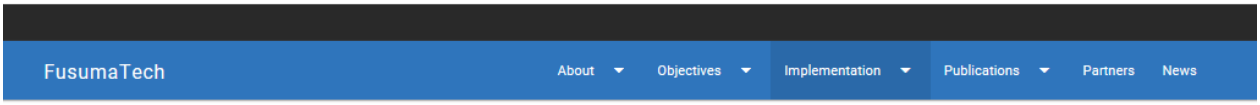


List of Work Packages

GENERAL TASKS DELIVERABLES

WP1 Project Decision Making and Management

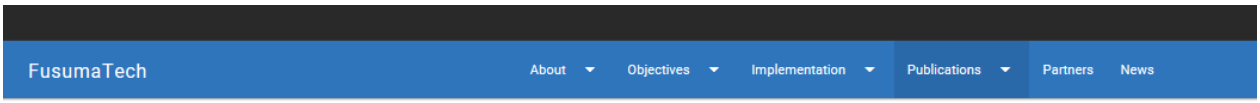
Leader: CEA



Deliverables

All the deliverables of the various workpackages can be found in the table below. Each deliverable has a number, a description, a leader and an indication of the month due.

Deliverable	Deliverable name	Work Package	Delivery Date
D1.1	Project Handbook	WP1	M2
D1.2	Mid-term Periodic Activity and Management Reports	WP1	M9
D1.3	Final Periodic Activity and Management Reports	WP1	M18
D2.1	Report on state of the art superconducting magnets	WP2	M14
D2.2	Report on market situation	WP2	M18
D2.3	Report on patents, IP agreements and trade secrets	WP2	M18
D3.1	Concept and methodology of the FuSuMaTech Phase 1	WP3	M12
D3.2	Prospective on the end-users' needs and final customer requirements	WP3	M18
D4.1	Development plan and schedule for generic R&D programme	WP4	M6
D4.2	Report on development for a network of test facilities to characterise materials, components and coils	WP4	M18
D4.3	Report on identification of the funding schemes and budget estimations for each R&D&I action	WP4	M18
D5.1	MgB2 Technology demonstrator: Solenoid 1m in diameter, 2m in length and 5T	WP5	M18
D5.2	Frontier-edge High Field MRI 16T concept magnet	WP5	M18
D5.3	Social magnet, Open MRI magnet, Mammo-magnet (conceptual design)	WP5	M18
D5.4	Technology demonstrator of an HTS insert for HFML	WP5	M18
D5.5	Gradient coils technology for high field MRI (over 10T)	WP5	M18
D6.1	Public Project Website and visual identity	WP6	M3
D6.2	Initial Dissemination and Exploitation plan of FuSuMaTech Phase 1	WP6	M3
D6.3	Workshop on Introduction to Intellectual Property	WP6	M6
D6.4	Final Dissemination and Exploitation plan of FuSuMaTech Phase 1	WP6	M18
D6.5	Proof-of-Concept funding proposal for new application domains	WP6	M18



Related Programs

Relations to European or international initiatives or projects

Through the consortium partners' involvement, FuSuMaTech Phase 1 is interconnected to the following projects or international initiatives expected to synergise the execution of FuSuMaTech Phase 1.

R&D&I initiatives		
Linked activities / project	Description	Partners involved in FusumaTech Phase 1
FP7 Preparatory Phase: TIARA Test Infrastructure and Accelerator Research Area	The main objective of TIARA is the integration of national and international accelerator R&D infrastructures into a single distributed European accelerator R&D facility with the goal of developing and strengthening state-of-the-art research, competitiveness and innovation in a sustainable way in the domain of accelerator Science and Technologies in Europe	CERN, CNRS, PSI, STFC
FP7 HiLumi LHC Design Study (2011-2015)	High Luminosity Large Hadron Collider Design Study	CEA, CERN, CNRS, STFC
FP7 EuCARD-2 Integrating Activity Project (2013-2017): Coordinated Research and Development on Particle Accelerators	The current project includes 40 partners from European laboratories working in particle physics. The project's broad goals include to network the various collider laboratories for collaborative infrastructure upgrades, and to reinforce connections among participating institutions for mutual benefit. Additionally, partners aim to concentrate common resources on a few selected research and development activities, and to share the challenges of such studies.	CEA, CERN, CNRS, KIT, PSI, STFC
H2020 ARIES Integrating Activities for Advanced Communities project in preparation	ARIES (Accelerator Research and Innovation for European Science and Society)	CEA, CERN, CNRS, KIT, PSI, STFC
H2020 Design Study EUROCIRCOL	The European Circular Energy Frontier Collider Study H2020-INFRADEV-1-2014-1, 201, 2015-2018 Michael Benedikt	CEA, CERN, CNRS, KIT, STFC
H2020 QUACO (2015-2020) H2020-INFRASUPP-2015-2 / COFUND (PCP)	By pooling efforts on cutting edge magnet developments necessary for the future of the LHC and using their experience from prior procurements, the partners in QUACO will act as a single buyer group in the framework of the precompetitive procurement (PCP) instrument.	CEA, CERN, ELYTT ENERGY, SIGMAPHI
AMICI	AMICI is devoted to Technological Infrastructures in the domain of accelerators and superconducting magnets, which are necessary to ensure the long term development of future Research Infrastructures. It aims at creating an efficient integrated ecosystem among laboratories focussed on R&D, and Industry, including SME, motivated by the innovative environment and the market created by the realisation of the technological needs of several RIs.	CEA, CERN, CNRS, PSI, STFC

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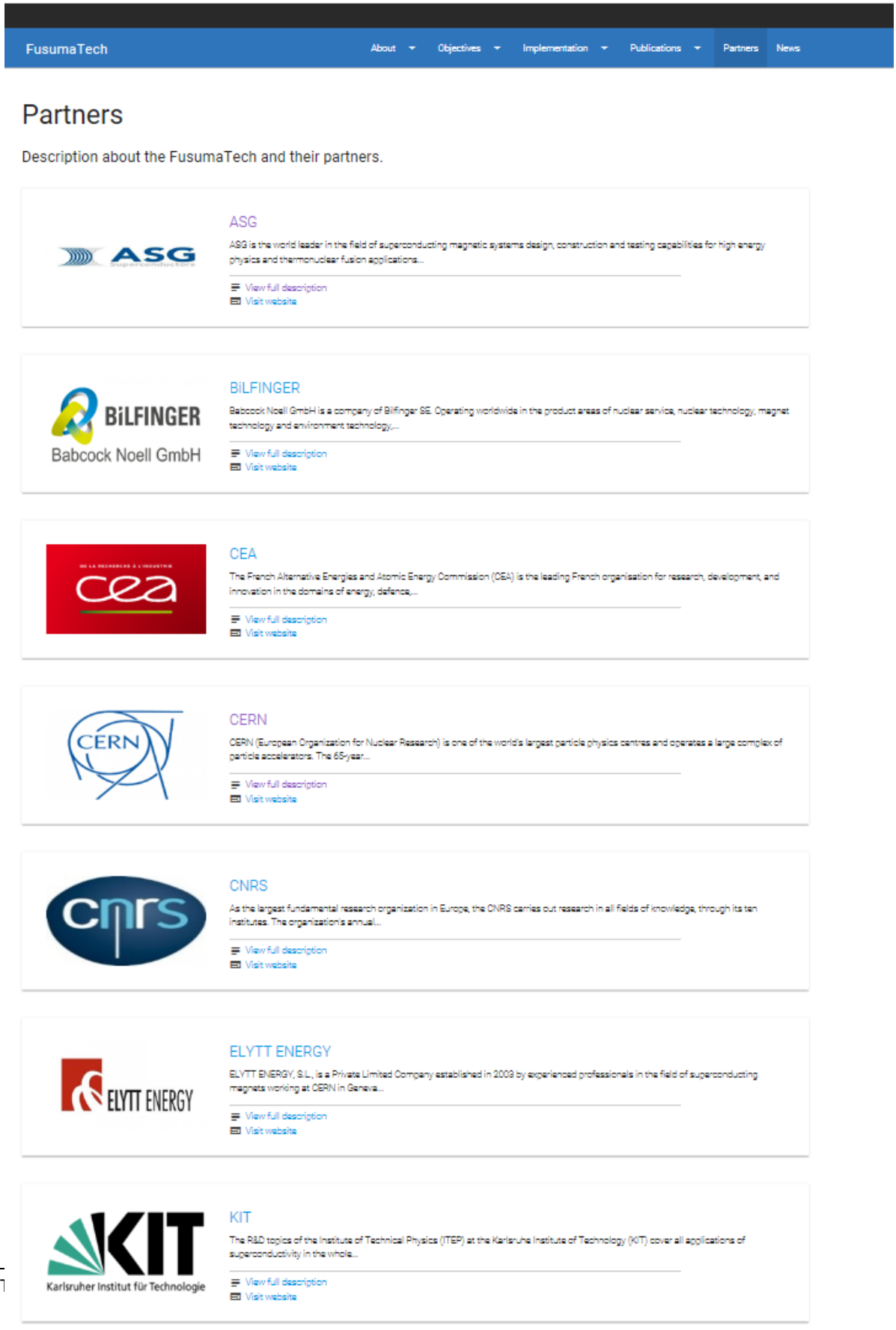
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Description about the FusumaTech and their partners.
ASG
ASG is the world leader in the field of superconducting magnetic systems design, construction and testing capabilities for high energy physics and thermonuclear fusion applications...
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ASG

Visit website

ASG is the world leader in the field of superconducting magnetic systems design, construction and testing capabilities for high energy physics and thermonuclear fusion applications. Its competencies range from design and manufacturing, up to testing of complete superconducting magnet systems.

The company's capabilities range from the design to the production and testing of superconducting magnets. ASG recently began diversifying its activities through its subsidiaries Paramed and Columbus Superconductors. In particular the company is broadening its reach into biomedical applications (diagnosis and therapy) and designing and developing magnetic systems for the energy industry (SMES, SFCL, wind turbines, energy transport systems).

ASG Superconductors collaborates, in Italy and abroad, with the leading companies in the industry as well as with the main scientific research institutes and centers.

ASG Headquarters, with administrative offices and four production bays covering 15,000 sq m, is located in Genoa. In 2010, after winning the international contract to build 10 superconducting coils for the ITER project, ASG built a new production facility in La Spezia.

Quality, Environment and Security are part of the most relevant duties of ASG Superconductors' policy and involve every aspect of the company's activities, from organization to design and manufacturing.

To maintain the highest standard of services and production quality, ASG Superconductors invests constantly in professional training and re-qualification of its employees.

It is corporate policy to hold regular qualification and certification courses for the personnel, with particular reference to: CAD, job management, informatics systems.

Aside from certifications obtained and maintained over the years, ASG can leverage expertise and excellences in design and productive traditions. The company's technology and design center - home to a multidisciplinary team of technicians, physicists and engineers - constitutes a reference point for all manner of requests coming from the industrial and research worlds.

Role:

ASG is going to be WP5 Leader and will be involved in all the other WPs.

Relevant Projects:

CYCLADS – CYCLotrons for Accelerator Driven Systems, Innovative Single Stage Cyclotron for High Power Applications, to be approved, Horizon 2020, CERN

Additional Information

▾ Infrastructure

The company's head office, where managers, physicists, engineers and production technicians work side by side, is situated in Genoa, near both the city's port and airport. The factory is divided into four bays covering a total surface area of 15,000 sq m. This is the original site of the company, dating back to when it formed part of the Ansaldo Group. Between 2010 and 2012 the production area was totally refurbished in a project that also involved the extension of the Clean Area (controlled temperature and humidity areas complying with specific environment and air cleaning procedures), which now occupies 9,000 sq m.

In 2010, after winning the international contract to build 10 superconducting coils for the ITER project, ASG began work on a new production facility in La Spezia, also in Liguria and close to the port, which was completed in less than 19 months. The new ASG Superconductors production facility contains four bays, covers a total surface area of 25,000 sq m and is fitted with the new technology and logistics equipment needed to manufacture and handle large-scale components, like the superconducting coils for the ITER project now in production, which exceed 15 meters in length and weigh over one tons each. The factory also has a clean area (controlled temperature and humidity areas complying with specific environment and air cleaning procedures) that covers 4,600 sq m and meets ISO Class 8 standards.

ASG has independent R&D laboratories inside the headquarters.

ASG Superconductors is part of the Malacalza family's high tech supply chain. This includes Paramed, known for its "open" MRI machines (based on a unique magnet design and innovative diagnostic imaging solutions), and Columbus Superconductors, producer of an innovative superconducting cable in Magnesium diboride (MgB_2). Both companies has independent research premises.

Columbus Superconductors is a company focused on the R&D and commercialization of new superconducting materials like MgB_2.Columbus has developed a proprietary method to manufacture MgB_2 wires, in such a way that its products are mechanically robust, reproducible and low cost compared to the other HST currently developed in form of long conductors. The reliability of the MgB_2 wires has been already demonstrated by the realization of a number of real-scale prototype devices, such as open-MRI systems, induction heaters, fault current limiters and numerous other magnets.

Paramed Medical Systems develops and produces open MRI systems with unique characteristics in terms of performance and patient comfort. Thanks to the synthesis of design and technology, Paramed offers advanced diagnostic imaging solutions that can create value for all those who operate in this sector. The company's flagship product, MrOpen, is the only "open" superconducting MRI system, realizable thanks to the design of the magnet that allows for carrying out stress-load exams, which in turn offer patients the most comfort. Behind Paramed's success is a team of professionals who bring together experience and competence with an authentic passion for the healthcare and magnetic resonance sectors and which every day work to serve technicians and patients.

▸ Key Personnel

▸ Publications

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