Future Superconducting Magnet Technology

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CONCEPT AND METHODOLOGY OF THE FuSuMaTech PHASE 1

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1. INTRODUCTION

The overall concept of FuSuMaTech Phase 1 is to develop a win-win strategy based on synergies between Industry and Academic partners in order to solve together the technology locks and offer new tools.
The purpose is to create the conditions for a big step in high-field applications both for accelerator magnets and for MRI, NMR and energy transmission applications.

2. THE BASIC IDEA OF FuSuMaTech

The basic idea of FuSuMaTech is to give to Academic and Industry teams the opportunity to work together on common subjects of interest. The origin of FuSuMaTech is the common desire of CERN and CEA to find synergies with Industry in the context of the huge development program launched by the European Particles Community for HL-LHC and FCC. This situation should give a big push to Applied Superconductivity in Europe.
Another innovative aspect of FUSUMATECH is the idea of associating industries from the beginning of the project instead of soliciting them later. As a first result, it gives advantage of gathering different skills and working methods.
Since 2015, the twelve industrial and academic partners have been working together to create an active network on the topic of superconducting magnets under the leadership of CEA and CERN in order to establish a set of R&D&I common subjects on the different roadmaps of academics and industries.
In 2017, the Future Superconducting Magnet Technology (FuSuMaTech) Initiative took a decisive step with the launch of the EU funded FuSuMaTech project (as part of the Horizon 2020 FET Open programme) which constitutes the first phase of the Initiative towards its objectives.
FuSuMaTech aspires to define the most efficient way to increase collaboration between industry and academia in view of overcoming technological barriers to bringing products into the market, supporting a European cluster in applied superconductivity.

3. WORKING METHOD TO HAVE INDUSTRY AND ACADEMIC PARTNERS WORKING TOGETHER

To strengthen the motivation of the industrial partners, the choice was to place these at the heart of the project by committing to them the management of the WP 4 and WP 5 (generic R&D&I actions and technology pilots).
For each subject, association between industry and academic partners is the rule and all the tasks of technology demonstrators are leaded by Industrial partners.

- Organisation of joint workshops
  The main events of the FuSuMaTech Phase 1 have been:
  - The Kickoff meeting (26th of October 2018 at CERN).
  - The Intellectual Property workshop (19th and 20th of April 2018 at CERN).
  - The Technical workshop (3rd and 4th of July 2018 at CEA Saclay and Paris).
  - The Final workshop to be held at CERN (1st of April 2019).

  In the organization of the events, the Project Steering Committee, including the workpackage leaders from Industry, has played the major role and participation of Industry representative has been favored.
- Meeting of partners (academics and industries) during scientific conferences on Applied Supraconductivity
  - This kind of unformal satellite meeting was already practiced before the Kickoff meeting at MT25 in Amsterdam (August 2017) and at EUCAS 2017 in Geneva (September 2017).
  - Industry and Academic Partners have participated together to the Accelerator-Industry Co-Innovation Workshop at Brussels in February 2018.
  - A similar meeting is planned during the next Applied Superconductivity Conference at Seattle late October 2018.
- FuSuMaTech topics are regularly included in articles and event to raise an awareness for the need to continue working with industry in this domain.
  - Accelerating News
  - CERN Courier
  - Articles on the FCC Website
  - FuSuMaTech R&D&I challenges were covered in all FCC related European Programmes
- Looking forward to the future technologies in the frame of the associated H2020 projects FuSuMaTech will support contributions to the EuroCirCol, EASITrain, AMICI and ARIES activities.
- A MoU is under preparation between FuSuMaTech partners in view of creating a sustainable scientific collaboration.

4. PROSPECTIVE VIEWS OF FuSuMaTech PHASE 2 IN THE CONTEXT OF INNOVATION IN EUROPE

The objectives of EU in the context of innovation in Europe are clearly established and can be expressed for FuSuMatech in the following way:

- Offer major advances in efficiency and performance using Future Superconducting Magnet Technologies for scientific instruments, medical instrumentation, electric power generation, energy storage and transport
- Support the European Cluster of Superconducting Magnet Technology, by preparing the future new challenging applications in the domain, and developing the existing partnerships between academics and Industry.
- Keep the European leadership in Applied Superconductivity by developing a co-innovation eco-system between academics and Industry.

The methodology of FuSuMaTech Phase 1 is also clearly established as follows:

- Propose cutting edge challenging magnets to be built with high performances, high efficiency in energy applications, medical applications etc. in order to stimulate technology R&D (technology demonstrators…)
- Establish basic tools of development necessary to consolidate innovative designs, advanced manufacturing and future applications (generic R&D …).

The tasks chosen by FuSuMaTech in the workpackages WP4 (R&D & I subjects) and WP5 (Technology demonstrators) appear to be pertinent axis for future developments.

- In the Phase 2, these tasks have to be really implemented in the frame of dedicated programs presented by a set of industry and academic partners (funding partners or new European partners).

The follow up of FuSuMaTech Phase 1 will be the establishment of the FuSuMaTech initiative in the frame of a scientific and technical collaboration.

When all the presently defined tasks will be accomplished, new ideas will merge and a steady state process of Research, Development and Innovation will take place.

Implementation of novel superconducting magnet technological and engineering approaches will contribute to the technical and economic development linked to research infrastructures, energy transition, medical diagnostics (MRI,..) and scientific instruments (NMR, ..). We expect that during the next years, system developments and cost reductions for components will prepare the economical basis for these new fields. Future Superconducting Magnet technology could become one of the key competences of the 21st century.

All this process will permit to build-up a European industrial leadership based on the present academic developments at the frontier edge of knowledge and technology and foster dramatically numerous co-innovation initiatives with industry.

5. CONCLUSION

The basic idea of FuSuMaTech has been easily adopted and put in practice by the Academic and Industry partners. In the formal frame of the FET CSA, the working methods have been easily implemented.
Encouraging prospectives are resulting of several contacts in the EU Direction of Research and Innovation. FuSuMaTech is strongly supported by CERN and CEA.
Preparing new applications to European programs and starting real work on the FuSuMaTech priorities is necessary in the coming months.

6. ASSOCIATED DOCUMENTS

The following deliverables also show the collaborative effort between industrial and academic.

Public Deliverables

- Deliverable 1.1 - FuSuMaTech Project Handbook
- Deliverable 6.1 - FuSuMaTech Public Project Website and Visual Identity

Confidential Deliverables

- Deliverable 6.3 – Workshop on Introduction to Intellectual Property
- Deliverable 1.2 – Mid-Term Periodic Activity and Management Report