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# MuCoL

A Design Study for a Muon Collider complex at 10 TeV centre of mass  
Horizon Europe Framework Programme

## DELIVERABLE REPORT

# DISSEMINATION AND EXPLOITATION PLAN

### DELIVERABLE

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**Abstract:**

The MuCol project's overall Dissemination and Exploitation plan, including the communication strategy, aims to target diverse stakeholders, ranging from the general public to decision makers at the European level. This will be achieved in several different ways depending on the target group. For instance, webpage posts, and engagement during summer student programmes, communications to physics conferences will be used to gain support within the particle physics community. By regularly highlighting societal and economic benefits of MuCol, for instance with applications of technical components that are going to be developed within the context of the MuCol Design Study and by celebrating anniversaries related to the underlying physics via LinkedIn, all the target audiences are going to be engaged. Accessible articles and engaging webpage content, shared via LinkedIn and magazines, aims to foster public understanding and support. A stream of content publication will ensure the broader reach of the project, which will contribute to the project success and funding acquisition. In addition, the internal communication will be also facilitated.

MuCol Consortium, 2024

For more information on MuCol, its partners and contributors please see <https://mucol.web.cern.ch/>

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**Delivery Slip**

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## 1 INTRODUCTION

This dissemination, exploitation, and communication strategy, which is based on the CERN Communications Strategy [1], will be crucial in advancing the MuCol project by disseminating the benefits of a muon collider, and will facilitate stakeholder engagement, fostering support, and enhancing visibility.

The following strategy focuses on developing and implementing a comprehensive communication strategy tailored to engage a diverse set of stakeholders effectively. The main points are the support for the design study by the various communities, which will be facilitated through accessible communication of the scientific and technical concepts and their applicability to society and thus demonstrating the project's impact and economic viability.

The strategy encompasses various communication methods, including articles in scientific publications and magazines, webpage posts, lectures during summer student programs, and utilization of online platforms such as LinkedIn. Evaluation metrics, such as webpage clicks, engagements with posts and monitoring follower growth, will be employed to measure the effectiveness of the communication efforts.

By effectively executing this communication strategy, we aim to strengthen collaboration, attract investment, and ultimately contribute to the success and advancement of the MuCol project.

## 2 TARGET AUDIENCES

### 2.1 PARTICLE PHYSICS COMMUNITY

One of the main objectives is to foster the support within the particle physics community for the MuCol design study. The communication methods include articles in scientific publications and dedicated webpage posts. Additionally, MuCol will integrate messaging into summer student program lectures and utilize channels such as LinkedIn and targeted email lists. The content will focus on explaining the physics programme's intricacies and objectives, with evaluation metrics including page clicks, post interactions, and follower engagement.

### 2.2 DECISION MAKERS

MuCol's communication strategy aims to augment the visibility of both European states and the European Union within the context of the MuCol project. Communication methods will include dissemination through respectable magazines with a worldwide reach and online platforms, centred around LinkedIn and the [MuCol homepage](#), referred hereafter to as homepage<sub>2</sub> as primary channels. The content will underline the significance of investing in cutting-edge research and its potential to drive technological innovation and economic growth. Evaluation will be based on metrics such as page views, engagement levels, and follower growth on LinkedIn. Additionally, the impact of the innovation aligned with the UN Sustainable Development Goals will be analysed.

### 2.3 GENERAL PUBLIC

For the General Public, MuCol's communication efforts will focus on the understanding of fundamental scientific concepts and their broader implications in both the particle physics context and society. Participants of the MuCol design study will spark curiosity and appreciation for science and muon colliders through accessible articles on the homepage, which will act as a central hub and popular science magazines, newsletters of the physical societies in Europe, and engaging webpage content. Besides the homepage, LinkedIn will serve as an entry point for reaching this audience, with content shared and reshared by collaborators to optimise the level of exposure. The content evaluation metrics will include tracking page views, interactions, as well as follower engagement on social media platforms.

### 2.4 FINANCIAL DECISION MAKERS

By demonstrating the significant return on investment offered by the MuCol project, MuCol's communication strategy seeks to engage financial decision makers. Through the exploitation of synergies with other scientific and industrial R&D projects, MuCol is a valuable platform to provide Europe a leading edge in both the discovery potential and the development of associated technologies. One of MuCol's objectives is to secure future financial support for the Muon Collider Technology studies via an accessible explanation of its synergies as well as its potential to boost innovation and economic growth to financial decision makers and other target groups. This will further raise awareness of MuCol's societal benefits. The dissemination will happen through LinkedIn and evaluation metrics based on page clicks, follower growth and engagement will be applied.

To ensure the effectiveness of our communication efforts, content will be published regularly, with dedicated posts on LinkedIn and the homepage serving as focal points for disseminating project updates and engaging stakeholders.

### 3 VALUES AND PRIORITIES

The target groups differ in their values and priorities, which are going to be examined in the following.

#### 2.5 PARTICLE PHYSICS COMMUNITY

For the particle physics community with a high previous knowledge of the physics context, the main priority is the scientific merit and the potential to reveal of new physics. Answers to fundamental questions that enhance the understanding of the underlying mechanisms of the universe are of great interest to this community. Additionally, technological challenge that a muon collider represents is also of vital interest. The study's scientific merits and developments will be highlighted through the publication of articles in national and international scientific magazines as well as through regular presentations at conferences at both national and international levels.

#### 2.6 DECISION MAKERS

The construction and operation of the Collider object of the MuCol Design Study has the potential to create employment opportunities for individuals in both industry and academia across Europe, which can have a positive societal and economic impact. Moreover, the study's contributions to the global scientific agenda may attract more research infrastructures and hence strengthen Europe's role, as well. Thus, the MuCol Design Study has the potential to contribute significantly to Europe's scientific excellence. The study aims to design the core principles of an accelerator complex using particles that have been never used before in a collider and accelerating them to unprecedented energies. This presents a unique challenge that requires a resource-efficient and sustainable design, particularly in terms of energy efficiency. Results and progress will be disseminated via many channels, such as LinkedIn, the homepage and popular science magazines, and presented at conferences at both national and international levels, such as at the European High-Energy Physics Conference series, IPAC and ICHEP.

#### 2.7 GENERAL PUBLIC

Regular updates on the webpage and social-media posts on LinkedIn will keep the interested general public informed about the study's progress. The dissemination will include scientific milestones as well as explanations of the physics background, which will be accompanied by figures illustrating and complementing the content. Furthermore, potential applications of the technological developments and societal applications will be disseminated to enhance the support for the MuCol Design Study for this target group. For instance, one societal application of muon detectors is muon tomography in civil engineering to assess damages in buildings, or the monitoring of the magmatic chambers of volcan such as the Stromboli in Sicily. Also, several technologies that will be studied in MuCol will be used in the next generation of fusion reactor, providing support to the production of nuclear energy without the use of fissile materials.

#### 2.8 FINANCIAL DECISION MAKERS

The positive societal and economic impact of the MuCol Design Study is underlined by the potential to create employment opportunities for individuals in both industry and academia across Europe if a Muon Collider is built. The impact of its contributions to the global scientific agenda may attract other research infrastructures and hence puts Europe's role in the global spotlight. The MuCol Design

Study thus has the potential to enhance the economic return to Europe based on scientific excellence and preparedness of European industries to new technologies. The design of the accelerator and the detectors, represent in fact a unique challenge, since for the first time muons will be accelerated to unprecedented energies, exploiting a resource-efficient and sustainable design.

Results and progress will be regularly communicated through multiple channels, such as LinkedIn, the homepage and popular science magazines, and presented at both national and international conferences, and leveraging synergies with other fields of science are part of the project goals.

## **4 COMMUNICATION GOALS AND MESSAGES**

### **2.9 PARTICLE PHYSICS COMMUNITY**

The scientific merit and the potential to reveal for new discoveries are the primary concerns for the particle physics community. The ultimate goal is to gain widespread support for the pursuit for of a Muon Collider. It is worth noting that unlike the Future Circular Collider, which is based on the idea and concepts of CERN's Lepton-Electron collider and the Large Hadron Collider, the muon collider presents a challenge for accelerator experts as no blueprint currently exists. As a muon collider would be a first of its kind, the MuCol Design Study presents a unique opportunity to explore a completely new concept. This project has the potential to push more boundaries beyond those of any other anticipated accelerator, making it an exciting and important endeavour. The MuCol Design Study aims to develop a blueprint and a foundation for a potential muon collider. This facility would be unique in that it would allow the collisions of fundamental particles that are not constituents of ordinary matter, making it a unique lepton-collider facility at the high-energy frontier.

### **2.10 DECISION MAKERS**

The main message to be conveyed is that investing in MuCol Design study is an investment in STEM skills, technological and industrial development for the EU and its member states. The MuCol Design study is a world-class research project, and both the EU and its member states are part it, with cutting-edge technologies that have the potential to transform society and to help address current global challenges such as producing and transporting electrical energy efficiently. Therefore, supporting and extending the MuCol Design study could lead to the creation of new EU-driven projects. The Design Study will result in enhanced collaboration with industry partners in the EU and EU universities. Even if a Muon Collider is built outside of Europe, the technologies developed, and the knowledge acquired during the MuCol Design Study could serve as a blueprint for future implementation. An example is the use of High Temperature Superconductors for magnets, where a synergic dialogue has already been open with the fusion community and the academic community around medical application. This synergic dialogue will place the European companies that will contribute to the study of a Muon Collider in advantage in several fields of application of those technologies.

In addition, the MuCol Design study has the potential to contribute to several United Nations Sustainable Development Goals (SDGs), including Education and Outreach through dissemination of the project to all target groups, and particularly by training young researchers through academic and industry projects, as well as Decent Work and Economic Growth, as the Design Study requires close ties with industry and has the potential to create EU-driven projects and job opportunities to create prototypes. Furthermore, the MuCol Design Study, with its innovative concept and its industry involvement, aims to contribute to the SDG covering Industry, Innovation, and Infrastructure. The

study seeks to provide enabling technologies, some of which can be applied to society, such as the next generation of superconducting magnets, to promote responsible consumption and production.

## 2.11 GENERAL PUBLIC

The emphasis will be on technological innovations, as well as the physics goals and background, to engage and educate the general public via LinkedIn. The connection to CERN and its world-class research, that has greatly deepened the understanding of the universe, using cutting-edge technologies and impressive engineering, will be highlighted. Furthermore, it will be noted that many fundamental mysteries remain that require further explanation. In this context, the muon collider aims to shed light on some of these questions, and potentially even answer them. The MuCol Design study represents a significant first step in this direction. During the Design Study, technological innovations that can be applied to society, such as medicine or used to energy-saving solutions. Additionally, the MuCol Design Study will be aligned with the SDGs, including Education and Outreach, Industry, Innovation, and Infrastructure, as well as Responsible Consumption and Production.

The Design Study will engage in promoting STEM in younger generations, and in particular in motivating young girls by providing role models with interviews to the women holding relevant roles in the collaboration.

## 2.12 FINANCIAL DECISION MAKERS

The main message to be conveyed is that investing in MuCol Design study can contribute to the development of STEM skills, technology, and industry in the EU and its member states. The MuCol Design study is a world-class research project, in which both the EU and its member states involved, utilising cutting-edge technologies that have transformed society and have the potential to help address current global challenges. Hence, supporting MuCol Design study projects could potentially initiate new projects driven by the EU. The technology for the Design Study will be developed in partnership with industry partners in the EU and EU universities. Regardless of whether a Muon Collider is constructed outside of Europe, the technologies developed, and the knowledge gained during the MuCol Design Study could serve as a model for future implementation.

MuCol will study a machine requiring technological breakthroughs, that have the potential to benefit society and secure a return on the financial investments. The widening of academia and industry's profile may attract other large-scale research infrastructures and result in the establishment of a European knowledge centre. A concrete example is the lifetime of a muon, which is about  $2.2 \mu\text{s}$ , leading to a reduction in the number of muons produced by about an order of magnitude before they enter the storage ring. Therefore, it is necessary to produce, accelerate and collide the muons quickly. This rapid handling presents the main challenges the project, but it is also the key to the innovation potential. For instance, innovative superconducting magnets will be required to ensure the focussing of the muon beam. The technologies to be used for those magnets will advance as well both industrial and medical applications.



## 5 INTELLECTUAL PROPERTY

In accordance with CERN's Intellectual property policy [2], the MuCol Design Study will offer its technical expertise and most innovative technologies for scientific and commercial purposes through various technology transfer opportunities. The MuCol Design Study will also license its technologies for commercial and academic partners. The aim is to generate technological results that have a potential for commercial exploitation. In this framework, the research goals are achieved through a collaborative contribution of technologies and/or resources, which are agreed upon by all parties.

## 6 FUTURE PLANS / CONCLUSION

This dissemination and exploitation plan presents the communications strategy for the MuCol Design Study to a range of target groups, including the particle physics community, the general public, decision makers and financial decision makers. The plan emphasises the use of the social media platform LinkedIn and the MuCol homepage as the primary channels for communication. These efforts, in which milestones and background information on various topics are covered, are complemented by outreach activities of the collaboration members. They present their work on a regular basis during collaboration meetings and conferences at national and international levels.

In addition to the scientific merits, the communication strategy emphasises the close connection to technological innovations for creating EU-driven projects and promoting innovation. Moreover, existing contributions to the SDGs have been acknowledged and there is the potential to address additional SDGs.

In the future, we aim to extend our reach to more social media platforms and talks for pupils.

## 7 REFERENCES

[1] Godinho, A. et al. (2021) *CERN Communications Strategy 2021- 2025* [online]. Available form : [https://international-relations.web.cern.ch/sites/default/files/files/strategy/Communications%20Strategy\\_2021-25\\_v3-planche.pdf](https://international-relations.web.cern.ch/sites/default/files/files/strategy/Communications%20Strategy_2021-25_v3-planche.pdf) [Accessed 23 March 2024]

[2] CERN Knowledge Transfer (2024) *Intellectual Property Management* [online]. Available form: <https://knowledgetransfer.web.cern.ch/activities-services/intellectual-property-management> [Accessed 22 March 2024]

## 8 ANNEX: GLOSSARY

Acronym	Definition
UN SDG	United Nations Sustainable Development Goals