The “Future Circular Collider Study”, hosted at CERN, investigates different scenarios for the post-Large Hadron Collider era. As part of this study, coordinated by Dr Michael Benedikt of CERN, the Horizon 2020 project “EuroCirCol” explores the feasibility of key technologies for a 100 TeV collider. Prof. Carmine Senatore of the University of Geneva is working on the development of superconducting wires for the accelerator magnets to reach a record field of 16 Tesla.

After the discovery of the Higgs boson particle in 2012, the Large Hadron Collider (LHC) is currently running at 6.5 teraelectronvolts (TeV) per beam, close to its design energy of 7 TeV. While scientific experiments continue in full swing far below ground, above ground, directly next to the machinery halls where the magnets are assembled and novel technologies are developed and tested, Dr Michael Benedikt coordinates the Future Circular Collider (FCC) Study. “The discovery of the Higgs boson was a milestone in our efforts to complete the Standard Model of particle physics. A new collider reaching higher energies and extreme luminosities would open up frontiers in physics research”.

CERN is the place to be “Designing and building the LHC took about 30 years. If we want to continue our research and confirm Europe as the preferred place for the next large-scale collider, now is the time to assess the different scenarios”, says Benedikt. More than 70 institutes from all over the world are collaborating in the FCC Study. “Due to the scale and complexity of this project and to ensure the continuation of worldwide research in particle physics, global collaboration is a necessity”.

“Due to the scale and complexity of this project [...] global collaboration is a necessity”

Most of the researchers participating know each other very well from previous projects. “Some of them are former postdocs who worked with me in Geneva”, says Carmine Senatore. For his research in applied superconductivity, CERN is the place to be. “Working closely with CERN enables us to participate in cutting-edge research projects”.

Robust wires Within the FCC Study, 16 institutes are collaborating in the Horizon 2020 project EuroCirCol, which aims to assess technological breakthroughs needed for a 100 TeV energy-frontier hadron collider. Senatore participates in the work package to design a high-field accelerator dipole magnet to achieve high-quality fields of up to 16 Tesla. “The required field strengths are far beyond the highest fields reached by magnets available today. To determine the characteristics of the required superconducting wires, we run analyses in our lab to test new configurations, shapes and structures”, says Senatore. For example, he applies X-ray tomography for 3D visualisation of voids in the filament structure of wires to test their robustness.
Meeting at CERN: Prof. Senatore, University of Geneva (left) and Dr Benedikt, CERN (right).

“Working closely with CERN gives us the opportunity to participate in cutting-edge research projects”

Prof. Carmine Senatore
Department of Quantum Matter Physics, University of Geneva

CONTENT SUMMARY

The Horizon 2020 project EuroCirCol aims to assess the feasibility, reliability and cost effectiveness of key technologies for a 100 TeV energy-frontier circular hadron collider as a possible successor to the Large Hadron Collider. For this project, coordinated by CERN, 16 partners from 9 countries work together to develop innovative designs for the collider ring, accelerator magnets and a cryogenic beam vacuum system.

FACTS AND FIGURES

**Project Name**
EuroCirCol – European Circular Energy-Frontier Collider Study

**Research Area**
Design Studies

**Organisations**
CERN (Coordinator) and 15 partners

**Start Date – End Date**
01.06.2015 – 31.05.2019

**Duration**
4 years

**Project Cost**
€11 million

**Project Funding**
€2.99 million

**Programme**
Horizon 2020 Excellent Science: Research Infrastructures

More Information
fcc.web.cern.ch/eurocircol/

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