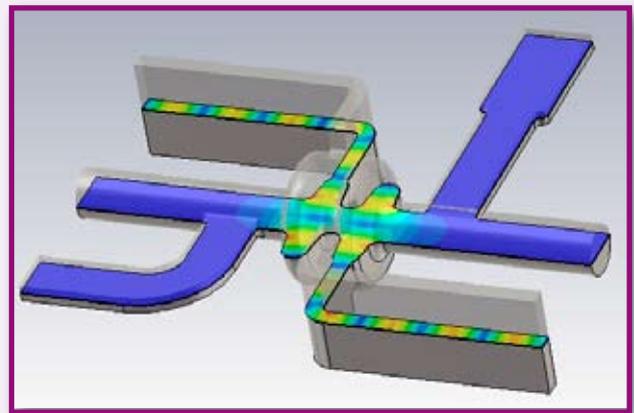


# EUCARD: European Coordination for Accelerator Research and Development

Acting like giant microscopes, particle accelerators give us a unique insight into the basic constituents of nature (matter, forces, energy). With the Large Hadron Collider, the most advanced accelerator soon in service, particle physics and cosmology are on the threshold of a new era of discoveries, recreating conditions just moments after the Big Bang. In addition, many accelerators contribute to medical imaging, cancer therapy, biology, material science as well as industry. With such a wealth of scientific and technical fields relying on accelerator technology, the European Strategy Group for Particle Physics has selected common priority areas of accelerator research and development including high-field magnets, superconductivity and linear colliders. Following on from the CARE project, the 37 partners of EuCARD gather together expertise to advance European particle research and upgrade its accelerator infrastructures.

## ● AN ACCESS CARD FOR NETWORKING AND ACCELERATOR FACILITIES

Accelerators are large and complex instruments. By combining the competences of many experts, this complexity can gradually be mastered. The EuCARD networks for science and communication offer common platforms where scientists and engineers from different fields can exchange their experience, confront their results, experiment new ideas and organise their collaborations. The networks focus on facilities for neutrino physics, accelerator and collider performance and radio frequency technologies, as well as dissemination and outreach. In the same spirit of exchange, two new facilities, MICE, a muon particle storage ring and HighRadMat, a test station for a pulsing particle beam, are open to other scientific and technical communities as part of the EU's support of transnational access.



## ● ACCELERATING NEW AND EMERGING TECHNOLOGIES

The fundamental ingredients of accelerator sciences are the abilities to guide, focus and accelerate particles. Once these foundations are established, a range of issues govern the performance level that can be achieved. At present, these fundamental ingredients are limited by the existing technologies, provoking active, world-wide research and development.

To guide and focus the high-energy particle beams requires magnets with large magnetic fields that are only achievable with superconductors. The superconductor currently in use limits the magnetic field to 10 Tesla. EuCARD will test the

suitability of a different material:  $Nb_3Sn$ , that should bring the field to 13 to 15 Tesla, supplemented by High-Temperature superconducting inserts that might boost it to 20 Tesla. These superconductors are brittle and represent real technological challenges to meet the extreme requirements of accelerator magnets.

As particle beams increase in power and intensity, the collimators responsible for the protection of the machine must become more efficient and robust. EuCARD will design and construct prototypes using a range of materials to meet these new requirements.

It is generally agreed that the next generation of particle accelerators for high-energy physics will be electron linear accelerators. They largely reduce the energy loss inherent to bending charged particles. However issues such as beam acceleration and stabilisation need to be investigated, for both the superconducting acceleration technology and an original

normal-conducting two-beam acceleration principle. EuCARD will contribute to this research, benefitting from synergies with world-wide networks of experts

EuCARD shall also assess novel accelerator concepts, contributing to new possibilities for a large range of accelerators.



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**EU project officer:** Hugues Cruzten

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**Partners:**

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Helmholtz-Zentrum Berlin für Materialien und Energie GmbH (DE)  
Budker Institute of Nuclear Physics (RU)  
Commissariat à l'Énergie Atomique (FR)  
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (ES)  
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