International Linear Collider and High Gradient Superconducting RF-Cavities

Results in Brief

International Linear Collider for unravelling secrets of particle physics and the origin of the universe

Linear colliders employ linear particle accelerators to accelerate electrons and their antiparticles to extremely high energies. EU-funded scientists are laying the detailed technical groundwork for construction of the most advanced collider ever built.

ENERGY

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The Large Hadron Collider (LHC) is currently the world's largest and most powerful particle accelerator. Its 27 kilometres (km) long ring is designed to store and collide sub-atomic particles.

ILC-HIGRADE is an EU-funded project for design and construction of a 31 km long International Linear Collider (ILC). ILC would be a linear electron–positron collider with 500 GeV (that is 500 billion electron volts) centre-of-mass-energy to avoid energy losses due to circular geometry. It would consist of two linear accelerators facing each other and propelling electrons at their anti-particles, positrons, at close to the speed of light. Since electrons carry no internal structure the measurements can be performed with high accuracy. The ILC is

expected to provide information about a wealth of unanswered questions in particle physics, from the nature of dark matter to the existence of hypothetical elementary particles. Building on the success of the LHC its initial task will be the precision measurement of the recently discovered particle that shows many properties of the long-sought Higgs Particle to establish its very role for particle physics.

ILC-HIGRADE researchers have significantly contributed toward completion of its technical design report in June 2013, which is sufficiently detailed so as to facilitate a comprehensive engineering design. The ILC will rely on superconducting radio-frequency (RF)-accelerating cavities that can provide the steep accelerating gradient that is required. These considerations constitute an important project cost. As such, partners are preparing 24 fully dressed cavities to serve as technical reference for a cost effective design process for high-gradient research.

Project scientists have also been evaluating the three sites proposed for the ILC facility, as well as various site-specific technical characteristics such as ground motion. Currently the sites proposed in Japan emerge as the most likely locations for the global facility. Finally, a preliminary framework for governance of the facility is under development with the help of insights gained from similar international projects.

High-gradient superconducting cavities stand to benefit numerous areas of particle research. They can provide insight into some of the most fundamental questions of the Universe, starting from the Big Bang and our origins to the nature of the forces that govern all particles today. ILC-HIGRADE is supporting this discovery process through the preparation of the world's most powerful particle accelerator.

Project Information

ILC-HIGRADE

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Project website

Project closed

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