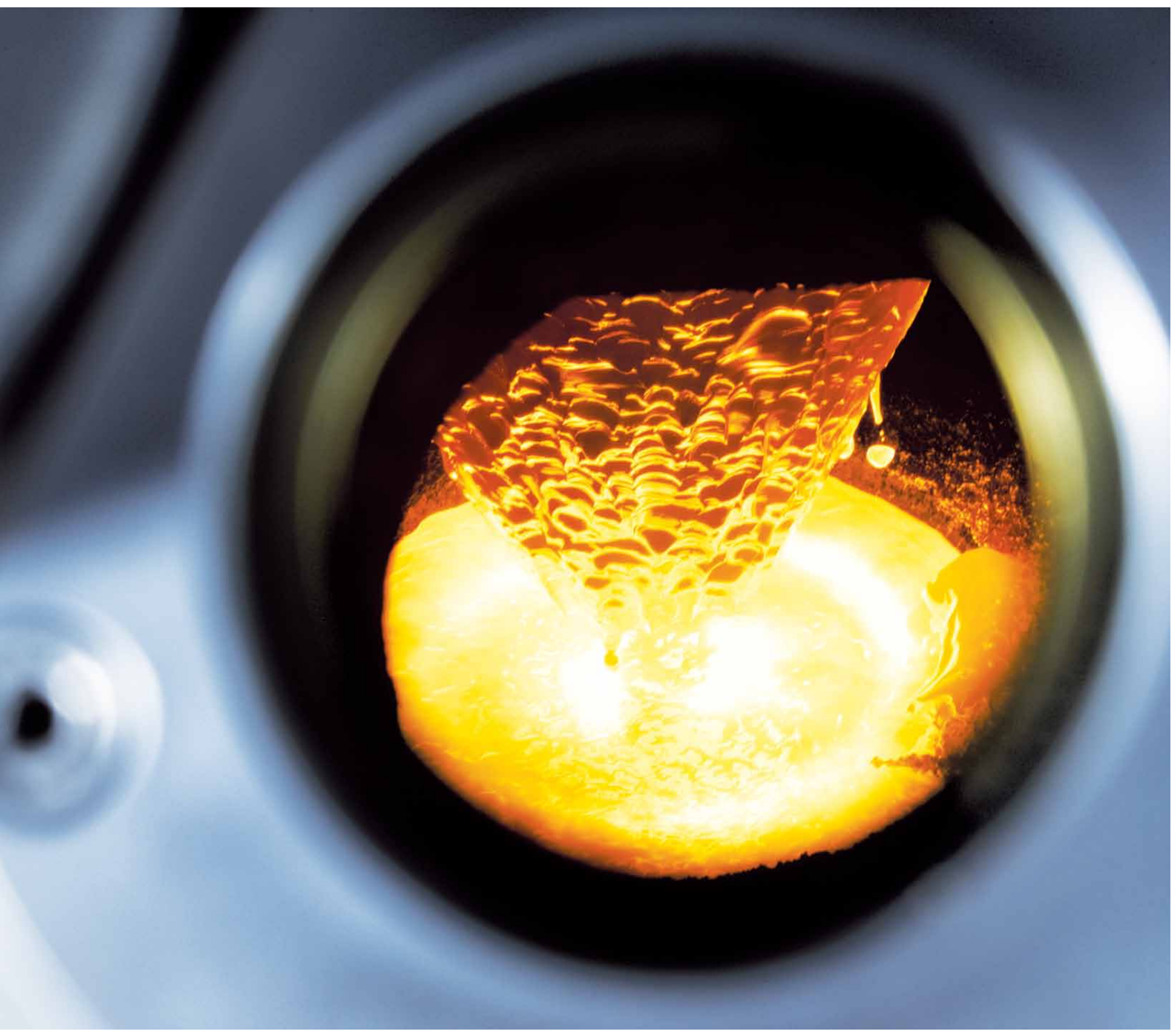


The International Linear Collider

This year will be a watershed in the progress of our understanding of the Universe. It will be the year in which the Large Hadron Collider (LHC) at CERN will find the Higgs boson (or rule out its existence). It has long been understood that the full richness of this and other expected discoveries at LHC can only be understood by detailed study in a very different and complementary type of particle accelerator, the International Linear Collider (ILC).

The year 2012 will also mark the completion of the ILC Technical Design Report (TDR) by the global team of some 2000 scientists. The Technical Design Report, documents the project's technical and organisational maturity and marks the fact that all major technical questions required to construct the ILC have been solved. The next stage, following peer review of the TDR and clarification of the LHC physics results, will be to seek a host and to select a site for construction. There have recently been encouraging signs that, for example, Japan may bid to host the ILC.

ILC-HiGrade is one of the major R&D activities in Europe addressing the ILC's key technology: particle acceleration with the help of superconducting radio frequency cavities. ILC-HiGrade will also conclude this year, having made great progress not only in the improvement of cavity performance, but also in questions of possible governance and implementation of a future ILC. The cavities purchased by ILC-HiGrade will shortly be characterised and studied at DESY with a view to a continuing programme of R&D mostly aimed at taking a further leap in cavity accelerating gradient which will carry forward the work of ILC-HiGrade. The Project Implementation Planning is in the final stages and will be published before the conclusion of ILC-HiGrade. This details how a future global laboratory could (and should) be organised from a legal, financial and administrative point of view.

Superconducting niobium cavities

How do superconducting cavities work? A voltage generator fills each hollow structure with an electric field. The voltage of the field changes with a certain frequency: a radio-frequency, or rf. Charged particles feel the force of the electric field and accelerate. Build the cavity out of a superconductor, such as niobium, and chill it to near absolute zero and you have a "superconducting rf cavity." They conduct electric current with almost no loss of energy, which means that nearly all the electrical energy goes into accelerating the beam, rather than into heating up the accelerating structures themselves.

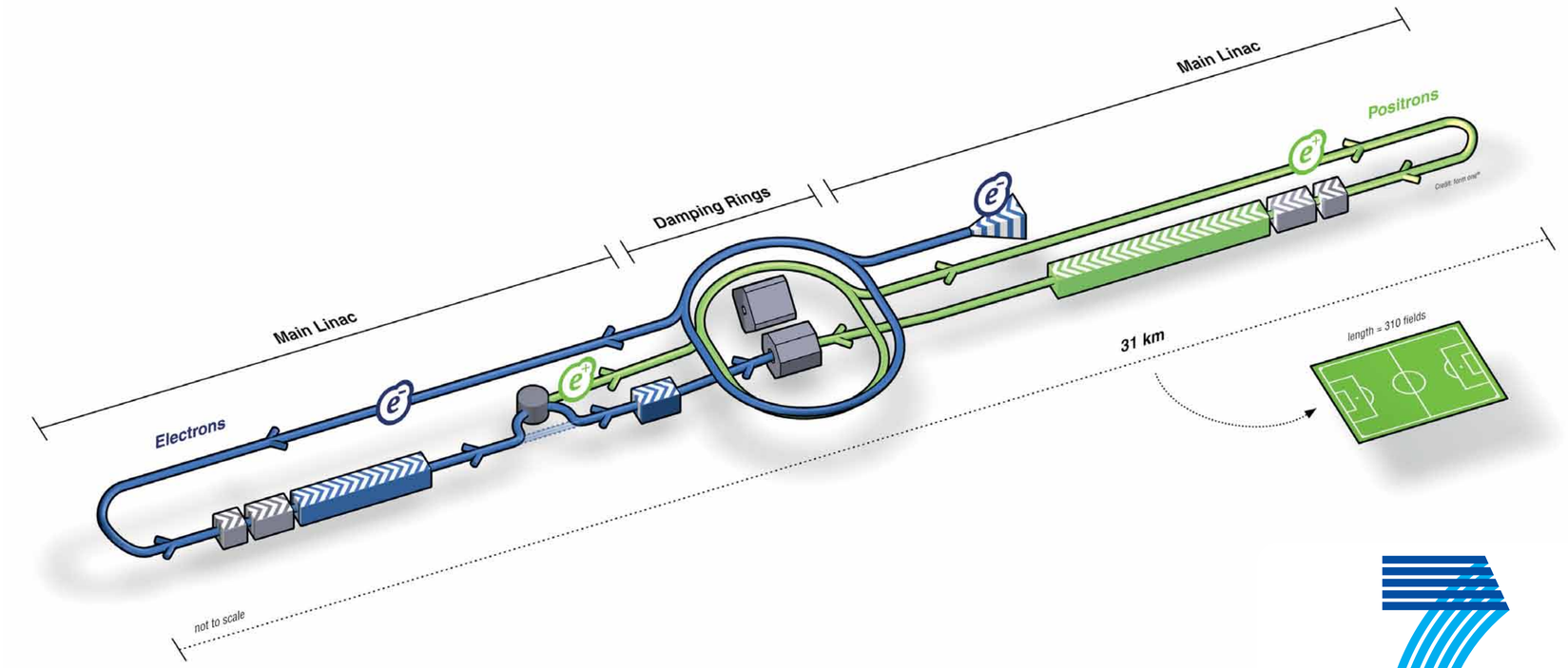
Designing and building the optimal cavity is not simple. The 1 metre-long cavities are made from nine cells, polished to provide micrometre-level surface smoothness, and free of impurities. Significant surface blemishes or dust could cause them to lose their superconductivity without sustaining the electric field needed to accelerate particles. A series of detailed chemical treatments and processes make the cavities literally sparkle, and a series of ultra-precise tests make sure that the cavities meet the high requirements for the International Linear Collider.

ILC-HiGrade: Towards the International Linear Collider

ILC-HiGrade or International Linear Collider and High Gradient Superconducting RF-Cavities produces a small series of accelerating cavities, superconducting components made of pure niobium for the International Linear Collider. It also plans a possible organisation and governance structure for the ILC as well as measures to prepare for the construction of the machine, including a detailed study on possible sites in Europe.

Participating Institutes:

- DESY (Germany)
- CEA (France)
- CERN
  (European Organization for Nuclear Research)
- CNRS/IN2P3 (France)
- INFN (Italy)
- Oxford University (United Kingdom)



Find out more: www.linearcollider.org, www.ilc-higrade.eu

SEVENTH FRAMEWORK PROGRAMME