WHAT HAVE WE LEARNT WITH THE LEP MACHINE?

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Twelwe years of physics at the LEP electron-positron collider of CERN have brought an impressive harvest of results. The Standard Model (SM) of Particle Physics has been tested quantitatively at the per mil level and found to provide an excellent description of all experimental facts. Theories attempting to go beyond the SM in order to cure some of its generic defects have been severely constrained. The extreme accuracy of several measurements gave access to the effect of virtual particle exchanges and provided key information on their existence and/or properties. The evolution of the couplings of the basic forces with the energy scale has been measured, suggesting the possibility of a Grand Unification at very high energy, in an extension of the SM called Supersymmetry. The highest energies obtained at LEP allowed to perform direct searches for the Higgs boson or alternative scenarios of Electroweak Symmetry breaking. New particles postulated by Supersymmetry were also looked for. No discovery was made, but some significant limits were set. All these experimental achievments were due to several technological and instrumental breakthroughs that I will briefly describe.

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