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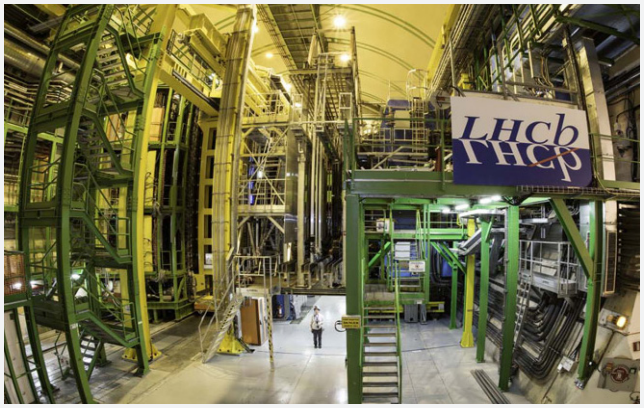

CP VIOLATION IN CHARM PARTICLES OBSERVED FOR THE FIRST TIME

An asymmetry of behaviour with respect to their antiparticles, called CP violation, has been observed for the first time in charm particle (containing a c quark, which has an electric charge of +2/3) decays. In particular, the CP violation was observed in D^0 mesons. The measurement was obtained by the LHCb detector at CERN's LHC accelerator and was coordinated by the INFN Bologna Divison, which is participating in the scientific collaboration of the LHCb experiment.

The result, which has a statistical significance of 5.3 standard deviations, was presented on March 21st at the Rencontres de Moriond EW conference and during a seminar at CERN.

Quarks can be divided into two categories: those of the "up type" with a +2/3 charge called up (u), charm (c) and top (t) quarks, and those of the "down type" with a -1/3 charge, i.e. the down (d), strange (s) and beauty (b) quarks. Property differences between matter and antimatter resulting from the so-called CP-symmetry violation phenomenon had been observed in the past only in the decays of strange and beauty particles, i.e. particles containing s quarks or b quarks. CP violation had never been measured before in the decays of particles containing quarks with a +2/3 charge.

The CP violation phenomenon was first observed in 1964 in the decay of neutral K mesons, and the two physicists who made the discovery, James Cronin and Val Fitch, were awarded the Nobel Prize for physics in 1980. At that time, the discovery was a great surprise to the particle physics community, then firmly convinced that CP symmetry could not be violated.

Thus the problem of how to include it in the mathematical description of the theory arose. A first theoretical contribution, subsequently fundamental for the development of a complete description of the phenomenon, had already been provided in 1963 in a famous article by Nicola Cabibbo, who had understood that the weak interaction 'interprets' particles composed of quarks as the result of mixing their various types. Starting