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RESEARCH

THE CLAS EXPERIMENT SHEDS LIGHT ON THE INNER STRUCTURE OF NEUTRONS AND PROTONS

A study conducted by an international group of researchers based on the data collected by the CLAS detector, an experiment housed

in the Jefferson Lab until 2018 and run with a decisive INFN contribution, provides new details on the inner structure of nucleons (protons and neutrons composing the atomic nucleus). The study was published on April 12 on the journal Nature. Thanks to a methodology that exploits polarised electron beams accelerated at low energies, it was possible to reconstruct the movement and arrangement of the quarks within target protons, with a spin oriented in a strong magnetic field, by analysing the distribution of the electrons after their interaction with the same protons. The measurement, together with other similar ones that will be performed by the CLAS successor, CLAS12, may improve the capacity of quantum chromodynamics (QCD, the physics theory that describes the strong fundamental force) to account for the complex interactions between quarks and gluons and how these determine the mass and spin of nucleons.

The CLAS measurement represents the latest result of a research field inaugurated in the early 2000s, that aims to improve our knowledge of the inner structure of nucleons and the accuracy of theoretical models that we use to describe it. Today, these models do not offer sufficiently accurate predictions for low-energy interactions in which the QCD generalisations are not applicable.