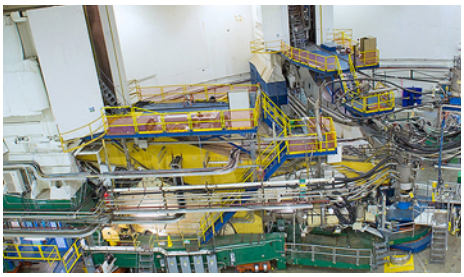

RESEARCH

THE E-97-110 EXPERIMENT MEASURES UNEXPECTED BEHAVIOURS IN NEUTRON CONSTITUENTS

A study published on 31 May in the journal Nature by the E-97-110 collaboration, an experiment housed at the Jefferson Laboratory in Newport News, Virginia, which involves an important INFN contribution, highlighted the anomalous behaviour of the constituents of neutrons under the action of a magnetic field. The anomaly refers to the way in which neutron quarks and gluons reorganise themselves following a change in the orientation of the particle's spin, owing to the magnetic field. The behaviour differs from that expected by non-perturbative quantum chromodynamics (QCD), the relevant theory for describing the interactions between quarks and gluons on the scale of nucleons, protons, and neutrons.

The E-97-110 experiment uses polarised electrons, or those with a spin oriented in a precise direction, produced by the Jefferson Lab's CEBAF accelerator, which are made to collide with a target of neutrons, which are also polarised. The task of studying the particles produced following the collision is entrusted to two large spectrometers.

The measurements made by E-97-110 demonstrate the lack, in the current state, of a realistic quantitative description of the strong interaction, the force responsible for the bond between the quarks inside the nucleons, on the spatial scale of these particles. ■