

The TWOCRIST Project at the CERN Large Hadron Collider: Pioneering a Novel Experiment to Explore Charmed Baryons

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The study of magnetic and electric dipole moments (MDM and EDM) of charm baryons, such as the Λ_c , offers an unprecedented opportunity to explore fundamental physics beyond the Standard Model. However, these particles have incredibly short lifetimes—just 10^{-13} seconds—making such measurements extremely challenging. A breakthrough becomes possible by confining their motion within the atomic lattices of ultra-pure bent crystals, where strong electromagnetic fields can induce measurable spin precession.

In early 2025, a pioneering set-up called TWOCRIST was installed at the LHC to test this concept at TeV energies for the first time. This proof-of-principle experiment consists of a solid fixed target, two bent crystals, and two precision detectors. The data collected from TWOCRIST will be critical in assessing the feasibility of a full-scale experiment, potentially to be realized during LHC Run 4, aimed at directly measuring the dipole moments of charm baryons. This talk will cover the motivation behind TWOCRIST, the innovative technologies involved, and how its results will shape the future of high-precision charm physics at the LHC.

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