

Dual-Readout Calorimeter for the future Electron-Ion Collider (EIC)

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Dual-readout calorimeters (DRC) have been developed by DREAM and RD52 collaborators for the last 20 years. They offer high-precision energy measurements for electromagnetic particles, hadrons and jets which are essential for the success of future collider experiments [1]. The Electron-Ion Collider (EIC) is a next-generation research facility at Brookhaven National Laboratory (BNL) to study the strong force inside the nucleus. The spin-polarized electron and ion beams at the EIC will allow us to study the protons and neutrons of the nucleus via deep-inelastic scattering. We aim at the design of a dual-readout calorimeter for the EIC. DRCs provide excellent energy resolutions for electromagnetic and hadronic particles and could reach the performances required by the EIC to achieve high-precision measurements for various physics goals.

Two of the main research goals of the Electron-Ion Collider are the 3D imaging of the internal structure of the nucleon at the level of the gluons (which carry the strong force) and sea quarks, and solving the proton spin puzzle, via the study of generalized parton distributions (GPDs) and transverse momentum-dependent parton distributions (TMDs). The interactions of high-energy electrons with protons will provide three-dimensional precision images of the internal structure of the nucleon via measurements at different energy ranges, describing how the gluons and sea quarks, and their intrinsic spins, are distributed in space and momentum inside the nucleon. They will also provide precision measurements of the quark and gluon contributions to the proton's spin.

References

- [1] S. Lee, M. Livan, and R. Wigmans, “Dual-readout calorimetry,” *Reviews of Modern Physics*, vol. 90, no. 02, p. 5002, 2018.