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Design of a cooling system for the EIC electron electromagnetic calorimeter and the study of the emergent mass of the hydrogen atom through Dynamical Chiral Symmetry Breaking. WEVERTON ALVES, Jefferson Laboratory and Catholic University of America — Unveiling the substructure of the atom one needs to understand the origin of its mass, e.g., through studies of lightest hadrons, the pions, and kaons. To study hadron structure, one needs powerful accelerators like the Electron-Ion Collider (EIC), a new nuclear physics facility to be built at the Brookhaven National Laboratory. To study pion and kaon structure at the EIC one needs to have precision Electromagnetic Calorimetry. An example of such a calorimeter is the Lepton Direction Electromagnetic Calorimeter. This calorimeter is made of lead tungstate (PbWO4) crystals. These must be cooled to achieve the desired performance. Studies of pions and kaons are fundamental and complementary to studies of the structure of the proton. One needs to peer deep inside the proton, where the strong force lies, and measure the binding energy that keeps the quarks together. This binding energy is given by the dynamical chiral symmetry breaking that one can study through the QCD Lagrangians chiral limit which gives ninety-nine percent of the mass. In this presentation, I will discuss the design of a cooling system for the EIC electron endcap electromagnetic calorimeter and the chiral limit in the QCD Lagrangian.

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