EXPOSING THE STRUCTURE OF THE PION

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Quantum Chromodynamics (QCD) has two emergent phenomena which are not apparent in the QCD Lagrangian: confinement and dynamical chiral symmetry breaking (DCSB). The unifying challenge of hadron physics is to understand the origin of, and interconnections between, these two phenomena and reveal their impact on hadron structure and formation. The hadron which expresses confinement and DCSB most uniquely is arguably the pion, which today is understood as both a bound-state of a dressed-quark and a dressed-antiquark in quantum field theory and the Goldstone mode associated with DCSB in QCD.

QCD's Dyson-Schwinger equations (DSEs) are a unique tool for hadron physics; wherein, confinement is expressed via a dramatic change in the analytic structure of QCD's Schwinger functions and DCSB, together with its consequences, is generated by quark-gluon interactions. Using the DSEs the impact of DCSB on numerous aspects of pion structure has recently been exposed. This talk will highlight these results, with attention paid to the pion's light-front wave function, electromagnetic form factor and parton distribution function. An example is given below, where the solid line is our result for the pion form factor and the dashed curve the conformal QCD result. The discrepancy is explained by DCSB, and encapsulated in the dot-dashed line, which will be explained further in the talk.