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Light-front holography and novel QCD phenomena

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Abstract content

The AdS/CFT correspondence between Anti-de Sitter space and conformal gauge theories provides an analytically tractable approximation to QCD in the regime where the QCD coupling is large and constant. "Light-front Holography" is a remarkable feature of AdS/QCD: it allows hadronic amplitudes in the AdS fifth dimension to be mapped to frame-independent light-front wavefunctions of hadrons in physical space-time, thus providing a relativistic description of hadrons at the amplitude level. In particular, there is an exact correspondence between the fifth-dimension coordinate z of AdS space and a specific impact variable ζ which measures the separation of the quark constituents within the hadron in ordinary space-time. This connection allows one to compute the analytic form of the frame-independent light-front wavefunctions of mesons and baryons, the fundamental entities which encode hadron properties such as spin-correlations and transversity and allow the computation of hadronic scattering amplitudes. The light-front Schrodinger equations predicted from AdS/QCD give a good representation of the observed meson and baryon spectra and give excellent phenomenological predictions for hadronic amplitudes such as electromagnetic form factors and decay constants. The hadronic light-front wavefunctions can be systematically improved by diagonalizing the QCD Light-Front Hamiltonian on the AdS/QCD basis. The AdS/QCD model predicts that QCD condensates are restricted to the interior of hadrons. I will also discuss a number of novel phenomenological features of QCD and a new method for computing the hadronization of quark and gluon jets at the amplitude level, an "event amplitude generator".

Summary

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