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Dynamical spin effects in the pseudoscalar meson octet within holographic light-front QCD

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We quantify the importance of dynamical spin effects in the holographic light-front wavefunctions of the pion, kaon, η and η' . Using a universal AdS/QCD scale and constituent quark masses, we find that such effects are maximal in the pion where they lead to an excellent simultaneous description of a wide range of data: the decay constant, charge radius, spacelike EM and transition form factors, as well as, after QCD evolution, both the Parton Distribution Function (PDF) and the Parton Distribution Amplitude (PDA) data from Fermilab. These dynamical spin effects lead up to a 30% chance of finding the valence quark and antiquark with aligned spins in the pion. The situation is very different for the kaon, where a simultaneous description of the available data (decay constant, radius and spacelike EM form factor) prefer no dynamical spin effects at all. The situation is less clear for the η and η' : while their radiative decay widths data are consistent with dynamical spin effects only in η' , the data on their spacelike transition form factors clearly favour maximal dynamical spin effects in both mesons.

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