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New limit of pion form factor at very large Q^2

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\documentclass[12pt]{article}
\usepackage{graphicx}
\def\today{}
\textwidth 18.3cm
\textheight 23.2cm
\setlength{\oddsidemargin}{-1.0cm}
\setlength{\evensidemargin}{-1.0cm}
\topmargin -1.50cm
\begin{document}
\title{New limit of Pion Form Factor at very Large Q^2 }
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\maketitle
In this talk a new F_π at $Q^2 \to \infty$ is presented.
Pion form factor is a very important quantity in hadron physics, it is
defined by following matrix element
\[<\pi^+|j_\mu(0)|\pi^+>=\int d^4 k_2\int d^4 k_1 Tr\{\phi_\pi(k_1,p_f)T_H(k_1,k_2,p_f,p_i)\mu
\phi\pi(k_2,p_i)\}=F_\pi(Q^2)P_\mu.\]
Perturbative QCD predicts that one gluon exchange dominates T_H at large Q^2.
The wave function ϕ_π is from nonperturbative QCD.
\[F_\pi(Q^2)|{Q^2\rightarrow\infty}=4\pi\alpha_s(Q^2)f^2\pi/Q^2\]
is most quoted, where f_π^2 is a quantity from nonperturbative QCD at low energies.
However, there are other
different F_π at $Q^2 \to \infty$, which are obtained by different
distribution amplitudes.
The Q^2 of current experiments is too low for testing these results.
A chiral theory of pseudoscalar, vector, and axial-vector mesons has been applied to study pion physics
at energy lower than 2 GeV. Theoretical results agree with data very well. Besides the ρ-pole pion form factor
there is
a new intrinsic form factor which obtained from this chiral theory. The ρ-pole form factor of pion has
shortcomings: in space-like region it decreases too slow and in time-like region it decreases
too fast. The intrinsic form factor redeems these two problems. Theory agrees with data very well
There is no new adjustable parameter in the new pion form factor.

The wave function of pion is obtained from this chiral theory, which successfully describes the
pion physics at lower energies. In this study the kernel T_H is determined by perturbative QCD and the wave
function of pion is obtained from the chiral theory.
The pion form factor at $Q^2 >> (1.8GeV)^2$ is obtained
\[F_\pi(Q^2)=4\pi\alpha_s(Q^2)f^2_\pi{1\over Q^2}{1\over18}(1-{2c\over g})^{-2}\{{2c^2\over g^2}
+(1-{c\over g})(1-{4c\over g})-{1\over 4\pi^2 g^2}(1-{c\over g})(1-{2c\over g})\}.\]
The numerical result is
\[F_\pi(Q^2)=2.65\times10^{-2}4\pi\alpha_s(Q^2)f^2_\pi{1\over Q^2}.\]
It is interesting to mention that at high Q^2 the ρ-pole with one gluon exchange behaves
like $\frac{1}{Q^4}$. Therefore, at high Q^2 the contribution of ρ-pole can be ignored.

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