ZEUS Diffractive Physics Group
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High-t Vector-Meson Photoproduction – Some Phenomenological Considerations –

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Last year at the EPS conference in Tampere, ZEUS presented the first measurements of the differential cross section $\frac{d\sigma}{dt}$ for proton-dissociative ρ^0, ϕ, and J/ψ photoproduction at values for $|t|$ between 1 and 10 GeV^2. In two weeks we will present at the ICHEP conference in Osaka an update of these results with an increase in statistics of a factor of three. These measurements are intrinsically interesting due to the fact that the $|t|$ values exceed the mass scales in the process, reaching an asymptotic region where the t dependence yields direct information on the dynamics of the scattering process. This is the first measurement at $|t|$ values comparable in magnitude to the Q^2 values attained at SLAC in 1967, when Bjorken scaling and the presence of point-like charged constituents of the proton were discovered. Recently it became clear that our data are sensitive enough to show a clear preference of a power n of 3 in a parametrization of the differential cross section of the form t^{-n}, appearing to exclude powers of 2 and 4 with considerable significance. This scaling law seems to indicate that we are observing the lowest-order process in a quantum field theoretical description of diffractive strong interactions.

The pQCD model of Brodsky *et al* based on two-gluon exchange predicts such a t dependence, but only in the case of longitudinal polarization of the vector meson, which our data exclude to an accuracy of about 10%. Ivanov *et al* have published work on a chiral-odd contribution to the production of transverse mesons which they claim is dominant in the t region of our measurements, but this contribution scales with t^{-4}. Kochelev *et al* have calculated the contribution of the exchange of an anomalous trajectory with the quantum numbers of the f_1 axial vector meson ("Regge-ized f_1 exchange"). Via private communication I received their prediction for the t dependence and found it to be a remarkably good fit to our data.

Unfortunately, due to time constraints at the time of this talk, I was not able to make the scaling and comparison plots with the new points for Osaka, and used instead last year's Tampere points. Since the results are consistent, I do not expect the messages of this talk to change, but it will be interesting to see these plots with the new points.

The transparencies of this talk can be found at

`www-zeus.physik.uni-bonn.de/~critten/dpf2000/diffgroup/talk_12jul/index.html`