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## Charm and Beauty Production from Semileptonic Decays at HERA

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Measurement of the photoproduction of b-quarks at threshold at HERA

The cross section of  $b\bar{b}$  photoproduction in ep collisions is measured with the H1 detector at HERA. Events containing b-quarks are identified through detection of two low momentum electrons in the final state. Semileptonic decays  $b\bar{b} \rightarrow ee X$  are exploited in the kinematic range of the photon virtuality  $Q^2 < 1 \text{ GeV}^2$ , the inelasticity  $0.2 < y < 0.8$  and the pseudorapidity of the b-quarks  $|\eta(b), \eta(\bar{b})| < 2$ . The differential b-quark production cross section is measured as a function of the transverse b-quark momentum and extends the previously experimentally accessible phase space towards the b-quark production threshold. The results are compared to other b-quark cross section measurements, as well as to QCD predictions.

Measurement of charm and beauty production in deep inelastic ep scattering from decays into muons at HERA

The production of charm and beauty quarks in ep interactions has been measured with the ZEUS detector at HERA for squared four-momentum exchange  $Q^2 > 20 \text{ GeV}^2$ , using an integrated luminosity of  $126 \text{ pb}^{-1}$ . Charm and beauty quarks were identified through their decays into muons. Differential cross sections were measured for muon transverse momenta  $p_T^\mu > 1.5 \text{ GeV}$  and pseudorapidities  $-1.6 < \eta^\mu < 2.3$ , as a function of  $p_T^\mu$ ,  $\eta^\mu$ ,  $Q^2$  and Bjorken  $x$ . The charm and beauty contributions to the proton structure function  $F_2$  were also extracted. The results agree with previous measurements based on independent techniques and are well described by QCD predictions.

Measurement of beauty production in DIS and F2b  $b\bar{b}$  extraction at ZEUS

Beauty production in deep inelastic scattering with events in which a muon and a jet are observed in the final state has been measured with the ZEUS detector at HERA using an integrated luminosity of  $114 \text{ pb}^{-1}$ . The fraction of events with beauty quarks in the data was determined using the distribution of the transverse momentum of the muon relative to the jet. The cross section for beauty production was measured in the kinematic range of photon virtuality,  $Q^2 > 2 \text{ GeV}^2$ , and inelasticity,  $0.05 < y < 0.7$ , with the requirement of a muon and a jet. Total and differential cross sections are presented and compared to QCD predictions. The beauty contribution to the structure function  $F_2$  was extracted and is compared to theoretical predictions.

Measurement of beauty production from dimuon events at HERA

Beauty production in events containing two muons in the final state has been measured with the ZEUS detector at HERA using an integrated luminosity of  $114 \text{ pb}^{-1}$ . A low transverse-momentum threshold for muon identification, in combination with the large rapidity coverage of the ZEUS muon system, gives access to a very large fraction of the phase space for beauty production. The total cross section for beauty production in ep collisions at  $\sqrt{s} = 318 \text{ GeV}$  has been measured to be  $\sigma_{\text{tot}}(ep \rightarrow b\bar{b} X) = 13.9 \pm 1.5(\text{stat.}) \pm 4.0\text{--}4.3(\text{syst.}) \text{ nb}$ . Differential cross sections and a measurement of  $b\bar{b}$  correlations are also obtained, and compared to other beauty cross-section measurements, Monte Carlo models and next-to-leading-order QCD predictions.

Charm and beauty production with semi-leptonic decay into electrons in DIS and PHP at ZEUS

The production of heavy quarks in ep interactions has been studied with the ZEUS detector at HERA in the photoproduction and DIS regimes using an integrated luminosity of  $360 \text{ pb}^{-1}$ . The heavy flavour events were identified using electrons with a transverse momentum of at least  $p_T(e) > 0.9 \text{ GeV}$  in the range  $|\eta(e)| < 1.5$ . The fractions of events containing the heavy quarks were extracted from a likelihood fit using variables sensitive to electron identification as well as to semileptonic decays. Total and differential cross sections for beauty, and in the case of photoproduction also for charm, were measured and compared with next-to-leading-order QCD calculations and Monte Carlo models. For squared four-momentum exchange of  $10 < Q^2 < 1000 \text{ GeV}^2$

the beauty contribution to the proton structure function,  $F_2^b$ , was extracted from the double differential cross section as a function of  $x$  and  $Q^2$ .

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