SEARCHES FOR NEW PHYSICS BY THE H1 EXPERIMENT AT HERA*

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The high energy program of the HERA ep collider ended in March 2007, where data equivalent to an integrated luminosity of ~ 0.5 fb^{-1} has been collected by the H1 experiment. In this context, some of the most recent results from H1 about searches for new phenomena are presented.

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The direct observation of excited states of fermions (f^*) as a natural consequence of the compositeness models [1,2] via their decay into a fermion and a gauge boson would be an evidence for a new level of substructure. New H1 results about the search for excited leptons (e^*, ν^*) make use of a total luminosity of up to 435 pb^{-1}. In the absence of a signal, 95% CL upper limits on the coupling f/Λ are derived as a function of the excited lepton mass as presented in figure 1. The new limits extend at high masses previous bounds reached at LEP and Tevatron colliders.

Events containing an isolated electron or muon, large missing transverse momentum and an high transverse momentum (P_{T}^X) hadronic system have been investigated by the H1 Collaboration [3]. The full HERA data corresponding to a luminosity of 478 pb^{-1} are used. The main SM contribution to such a signature comes from the production of a real W boson with subsequent leptonic decay. Figure 2 shows the observed P_{T}^X distributions separately for the e^+p and e^-p data together with the corresponding SM expectations. For $P_{\mathrm{T}}^X > 25$ GeV, 24 data events are observed compared to a SM prediction of 15.8 ± 2.5. In this region, an excess of e^+p data events is observed, equivalent to a fluctuation of order "3σ". The observation in the e^-p data is consistent with the SM expectation.

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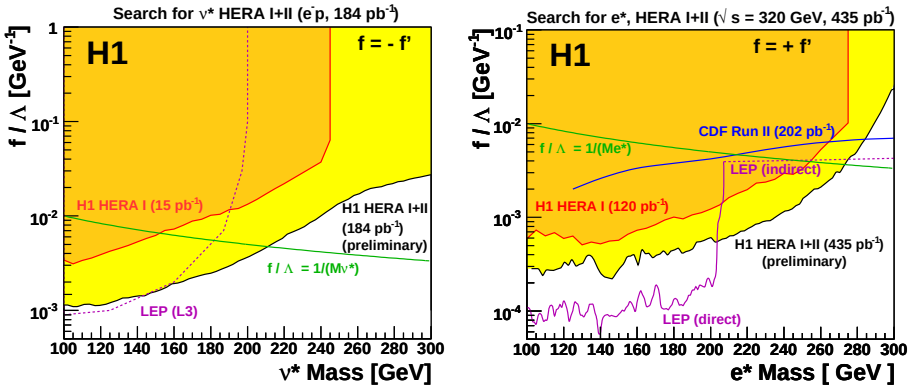

Fig. 1. Limits at 95% CL on the coupling constants f/Λ for excited neutrino (left) and electron (right).

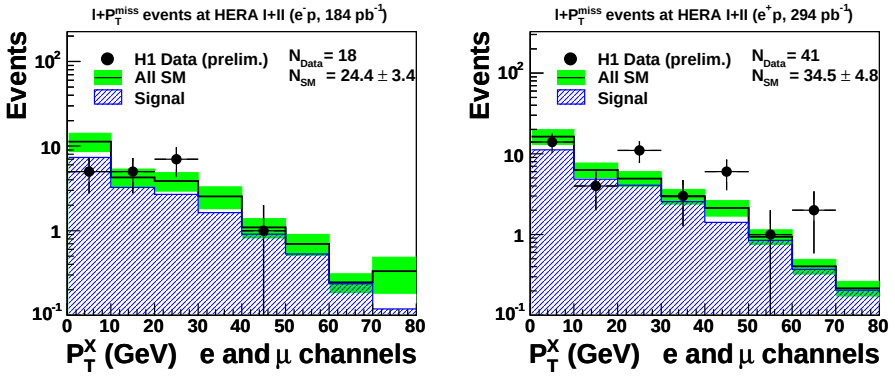

Fig. 2. Distributions of the transverse momentum of the hadronic system P_{T}^{X} for the electron and muon channels combined in the $e^{-}p$ (left) and $e^{+}p$ (right) data.

A model independent general search for deviations from the SM has been performed by H1 using all HERA II data. Following [4], all final states containing at least two objects (e, μ, j, γ, ν) with $P_T > 20$ GeV in the central region of the detector are investigated. Figure 3 shows the event yield subdivided into event classes for the data and SM expectation for $e^{+}p$ and $e^{-}p$, respectively. A general good agreement is observed between the data and the SM prediction. A statistical algorithm is used to quantify the significance of possible deviations from the SM. The largest deviation is observed in $e^{+}p$ data in the μ-j-ν channel, which corresponds to the topology of isolated lepton events.

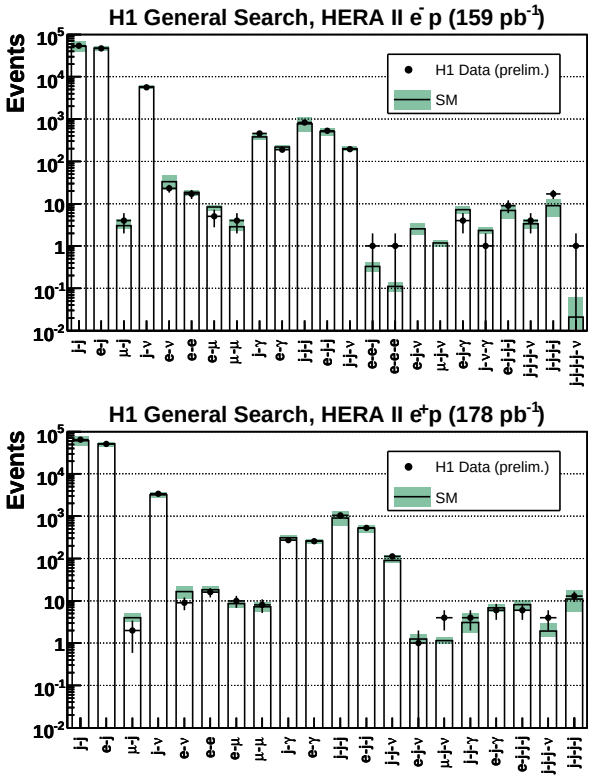

Fig. 3. The data and the SM expectation for all event classes with observed data events or a SM expectation greater than 1 event.

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