H1prelim-04-063
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High $\mathrm{P_T}$ analysis of the HERA II data

H1 Collaboration

Abstract

Preliminary messages for spring conferences 2004 on high $\mathrm{P_T}$ analyses of the HERA II data ($\mathcal{L} = 17$ pb^{-1}) including isolated leptons, multi-electrons and general search for new phenomena. The analyses are identical to those performed on HERA I data (see [1–3]).

1 Multielectron Analysis

Update of [1] with HERA II data ($\mathcal{L} = 17$ pb^{-1}).

Selection	Data	SM	Pair Production (GRAPE)	DIS + Compton
"2e"	10	15.8 ± 1.7	13.5 ± 1.4	2.3 ± 0.5
"3e"	2	3 ± 0.4	3 ± 0.4	0

Table 1: Observed and predicted multi-electron event yields for the di-electron and tri-electron samples. The analysed Hera-II data (2003-2004) data corresponds to an integrated luminosity of 17 pb^{-1} . The errors on the prediction include model uncertainties and experimental systematic errors added in quadrature.

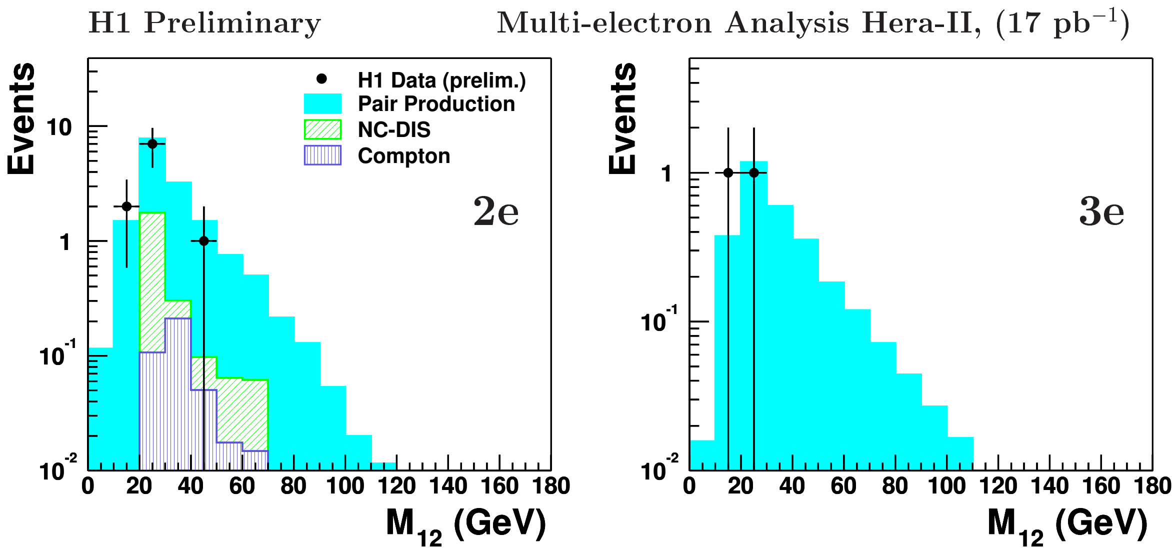

Figure 1: Distribution of the invariant mass M_{12} of the two higest P_T electrons compared to expectations for events classified as "2e" (left) and "3e" (right). The analysed Hera-II data (2003-2004) data corresponds to an integrated luminosity of 17 pb^{-1}.

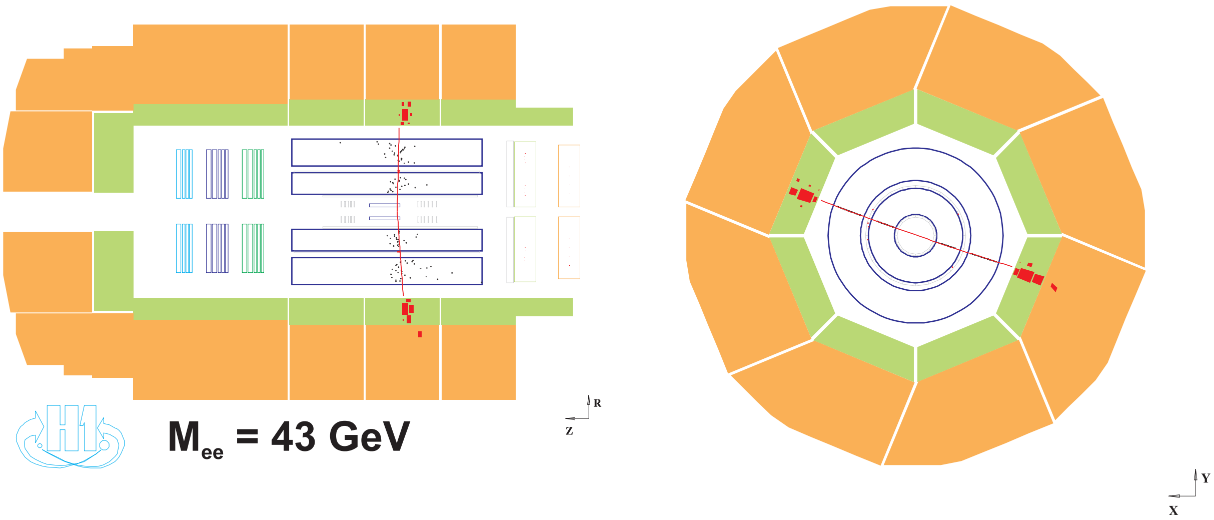

Figure 2: Display of the di-electron event observed with the highest mass M_{12} = 43 GeV in new Hera-II data.

2 General Search Analysis

Update of [3] with HERA II data ($\mathcal{L} = 17$ pb^{-1}).

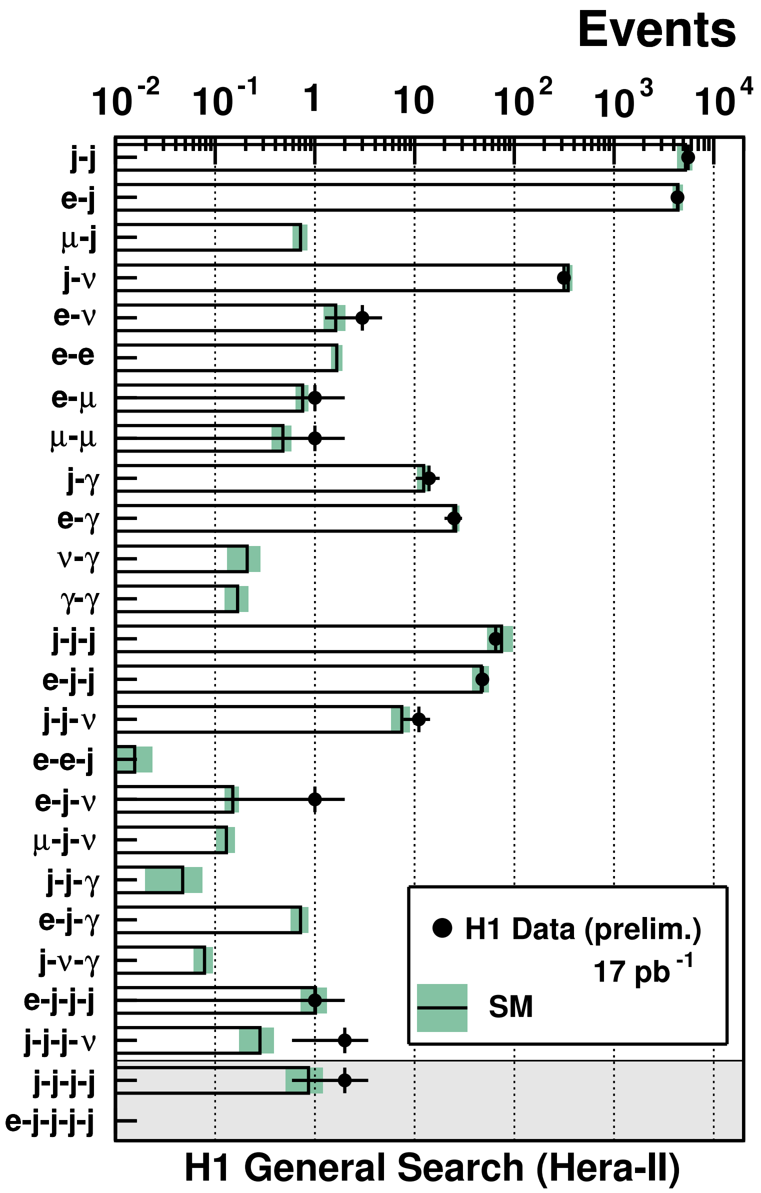

Figure 3: H1 General Search using the new Hera-II data (2003-2004). The analysed data sample corresponds to an integrated luminosity of 17 pb^{-1}. The errors on the prediction include model uncertainties and experimental systematic errors added in quadrature. The event classes with more than 3 jets are placed in a grey area since their SM prediction suffers from larger theoretical uncertainties.

3 Search for events with isolated leptons and missing transverse momentum

Update of [2] with HERA II data ($\mathcal{L} = 17$ pb^{-1}).

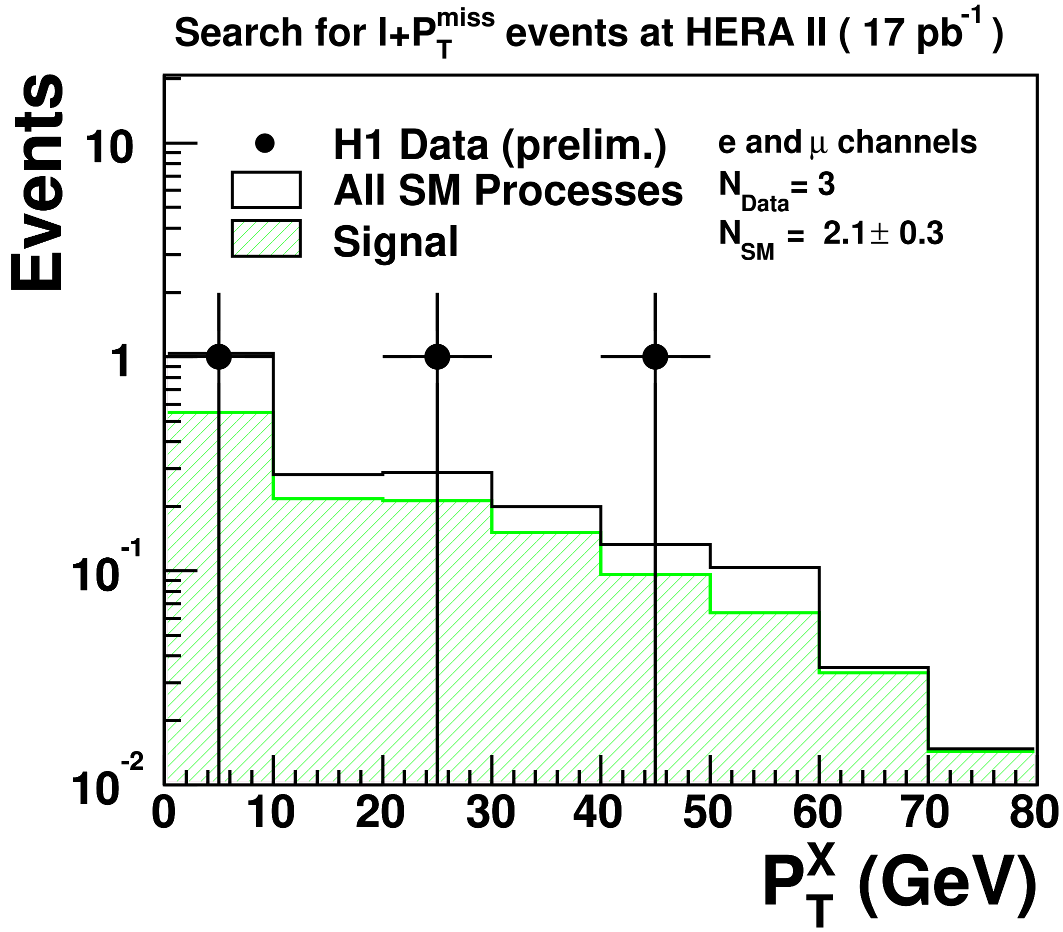

Figure 4: The hadronic transverse momentum distribution in the electron and muon channels combined data (HERA II, $\mathcal{L} = 17$ pb^{-1}) compared with the SM expectation (open histogram). The "signal" component of the SM expectation, dominated by the real W production, is given by the hatched histogram. $\mathrm{N_{Data}}$ is the total number of data events observed for each sample. $\mathrm{N_{SM}}$ is the total SM expectation.

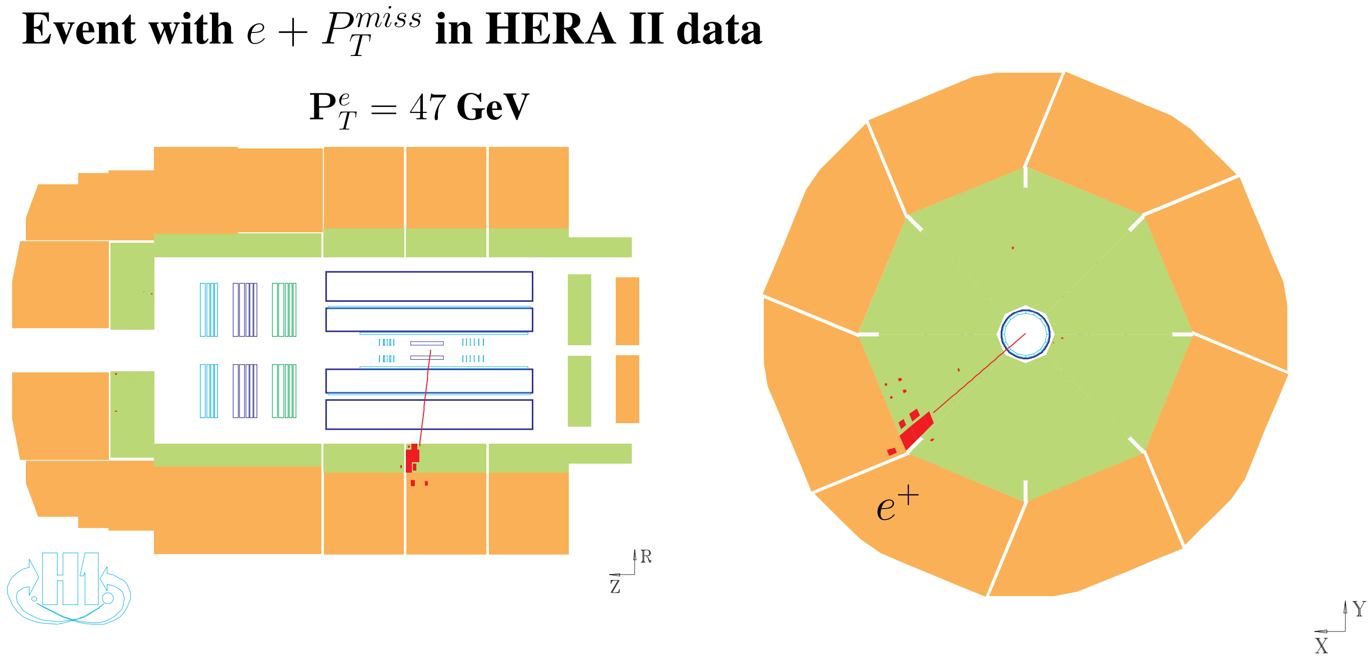

Figure 5: Display of an event with an isolated electron and missing transverse momentum - candidate for elastic W production (HERA II data).

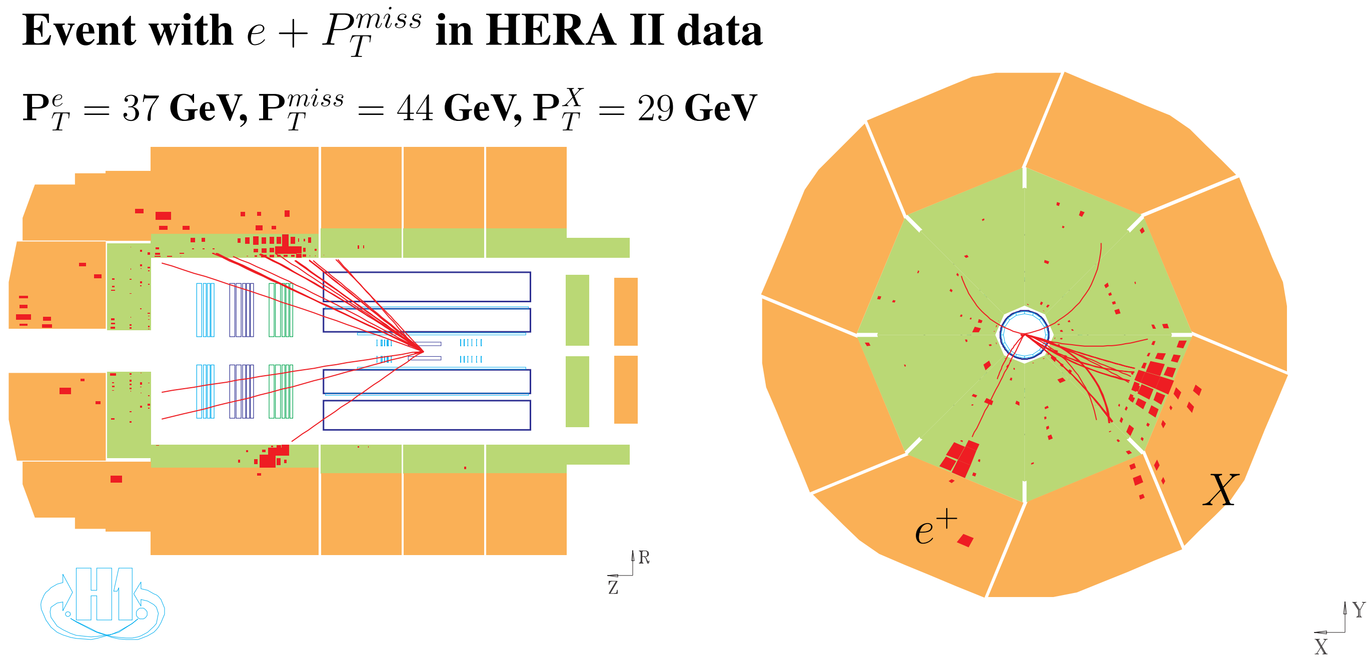

Figure 6: Display of an event with an isolated electron, missing transverse momentum and a prominent hadronic jet (HERA II data).

	H1 Data	SM expectation	SM Signal
Electron			
Total	**3**	**1.61 ± 0.29**	**0.97 ± 0.29**
P_T^X>25 GeV	**2**	**0.34 ± 0.07**	**0.22 ± 0.05**
Muon			
Total	**0**	**0.44 ± 0.12**	**0.39 ± 0.08**
P_T^X>25 GeV	**0**	**0.29 ± 0.08**	**0.26 ± 0.05**
Electron and Muon			
Total	**3**	**2.05 ± 0.32**	**1.36 ± 0.27**
P_T^X>25 GeV	**2**	**0.63 ± 0.11**	**0.48 ± 0.10**

Table 2: The results of the search for events with isolated electrons or muons and missing transverse momentum in HERA II data ($\mathcal{L}$=17 pb^{-1}): observed and predicted numbers of events in the electron channel, in the muon channel and the sum of electron and muon channels. The "signal" component of the SM expectation, dominated by the real W production, is also given.

References

[1] A. Aktas *et al.* [H1 Collaboration], "Multi-electron production at high transverse momenta in e p collisions at HERA," Eur. Phys. J. C **31** (2003) 17 [arXiv:hep-ex/0307015]. http://www-h1.desy.de/h1/www/publications/htmlsplit/DESY-03-082.long.html

[2] V. Andreev *et al.* [H1 Collaboration], "Isolated electrons and muons in events with missing transverse momentum at HERA," Phys. Lett. B **561** (2003) 241 [arXiv:hep-ex/0301030]. http://www-h1.desy.de/h1/www/publications/htmlsplit/DESY-02-224.long.html

[3] "General Search for New Phenomena in ep scattering at HERA" http://www-h1.desy.de/h1/www/publications/htmlsplit/H1prelim-03-063.long.html