

DIS 2001

Bologna, 28/04/2001

Measurement of $F_2(x, Q^2)$ with Radiative Events at HERA

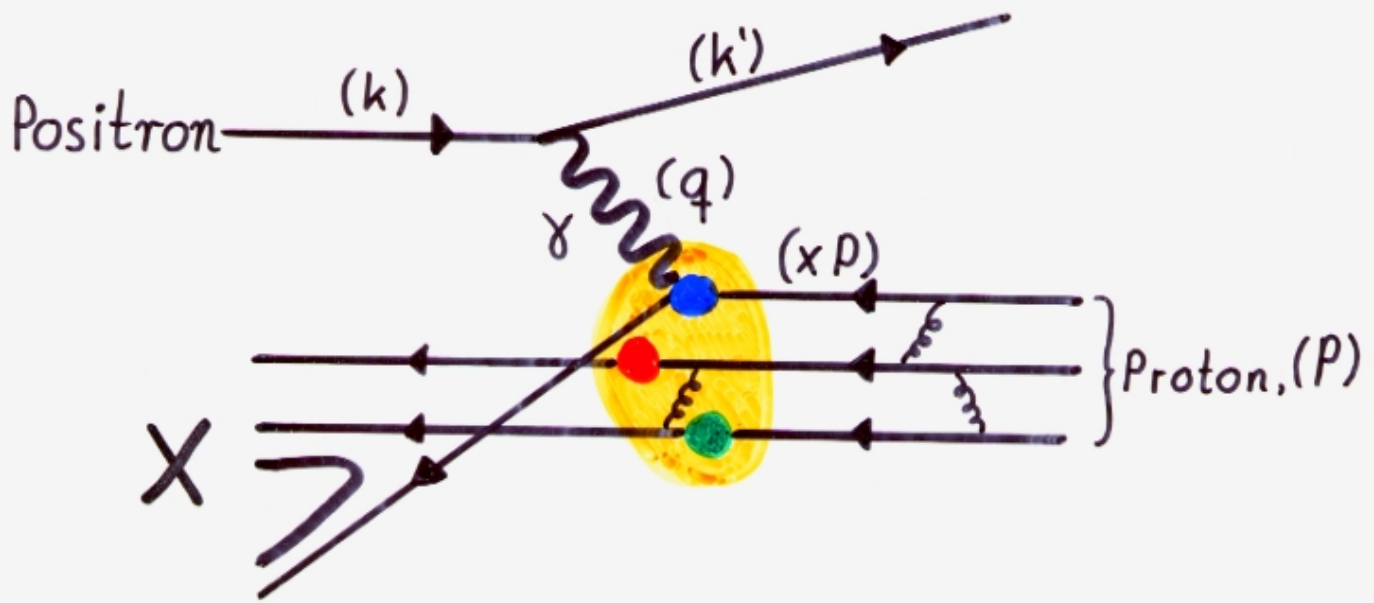
Ç. İşsever, University Dortmund
for the H1 Collaboration

▶ Motivation

▶ Technical Aspects

▶ Results

ep-Scattering at HERA



► Virtuality: $Q^2 = -q^2 = -(k - k')^2$

► Bjorken Scale Variable: $x = \frac{Q^2}{2p \cdot q}$

► Inelasticity: $y = \frac{p \cdot q}{p \cdot k}$

► Center of mass energy: \sqrt{s}

$$Q^2 = s \cdot x \cdot y$$

Cross Section

$$\frac{d^2\sigma}{dx dQ^2} = \frac{2\pi\alpha^2}{x Q^4} (1 + (1-y)^2)$$

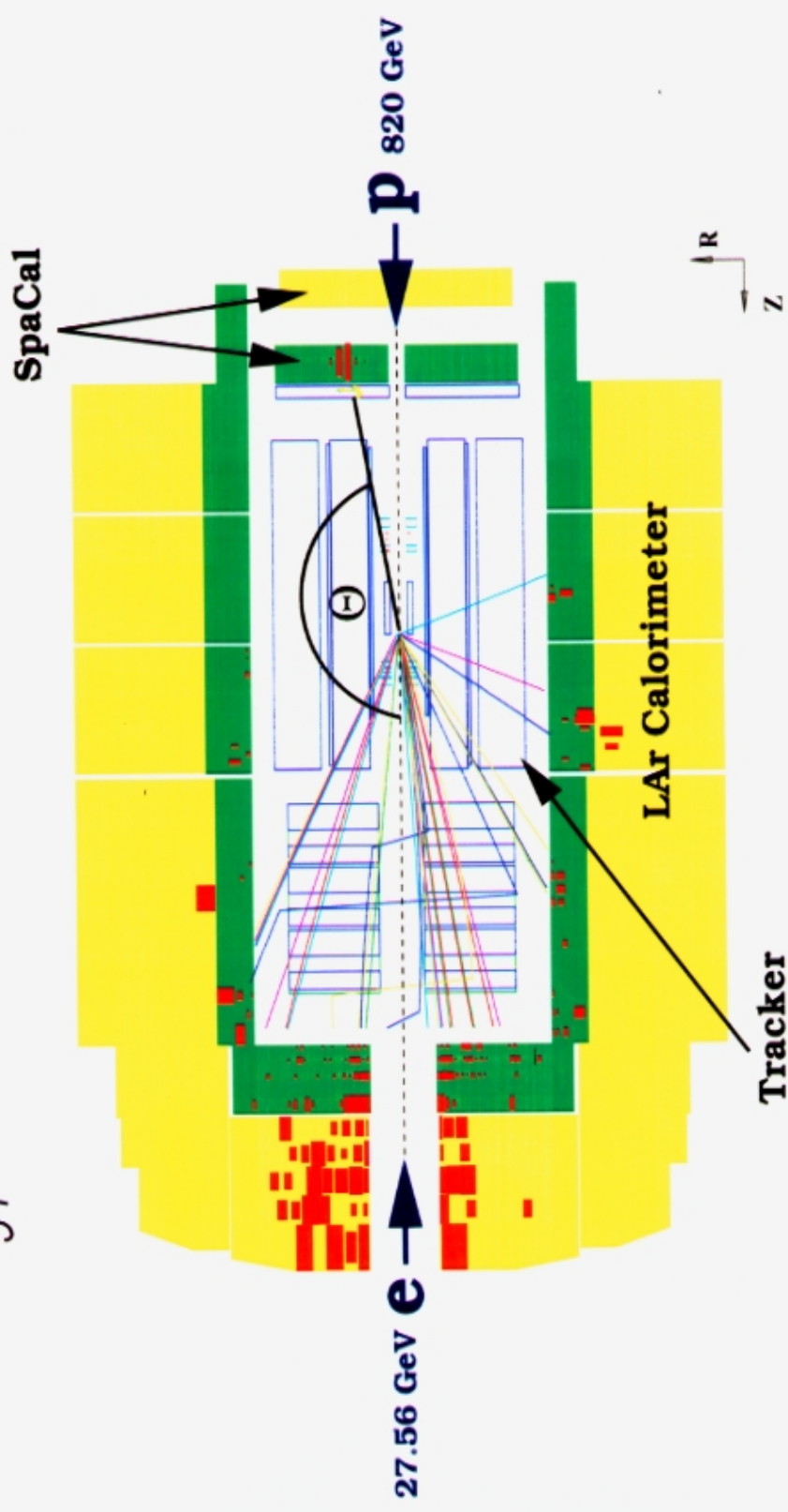
$$\cdot [F_2(x, Q^2) - \frac{y^2}{(1+(1-y)^2)} F_L(x, Q^2)]$$

low y : $y < 0.6$

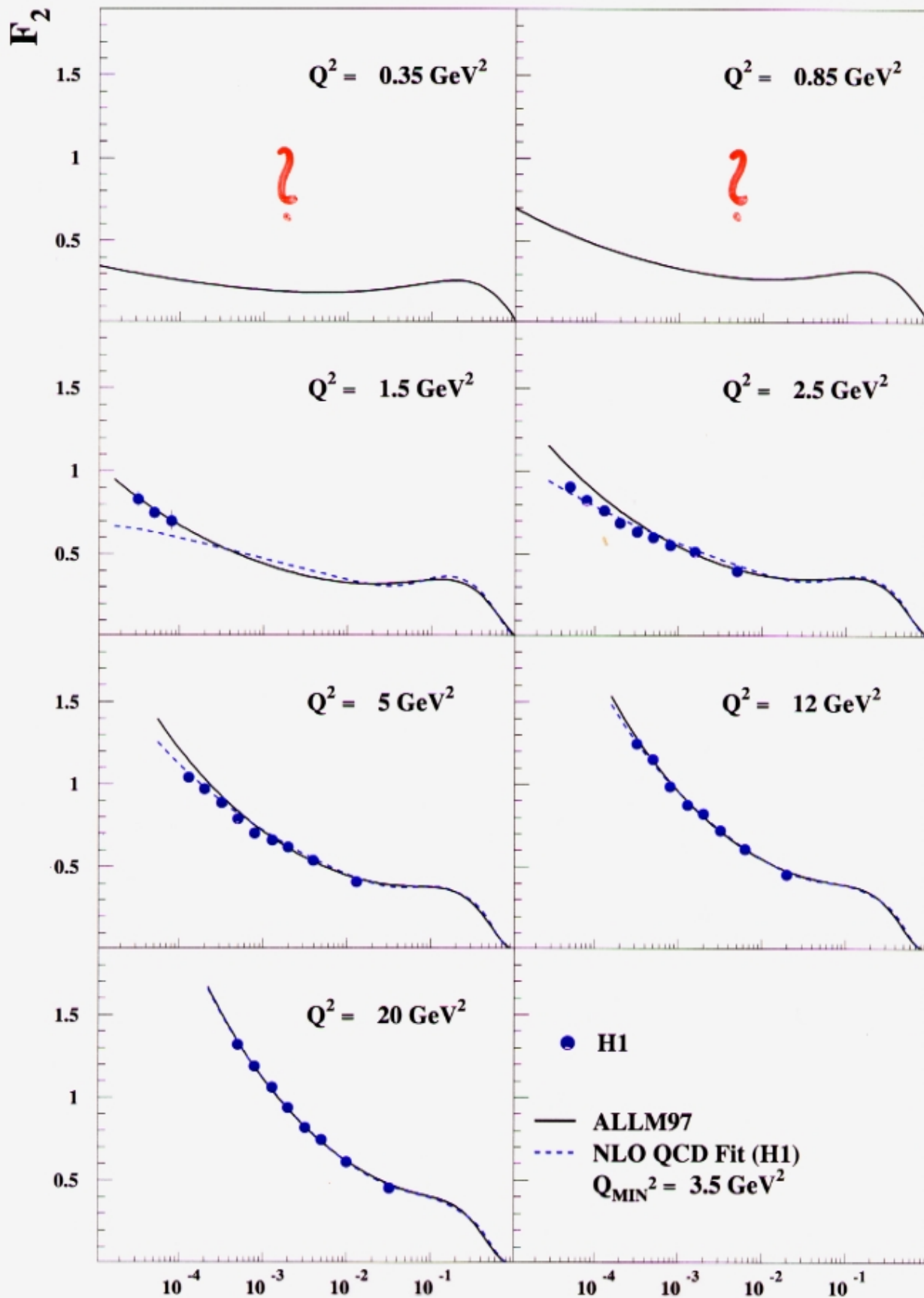
high y

H1 Detector

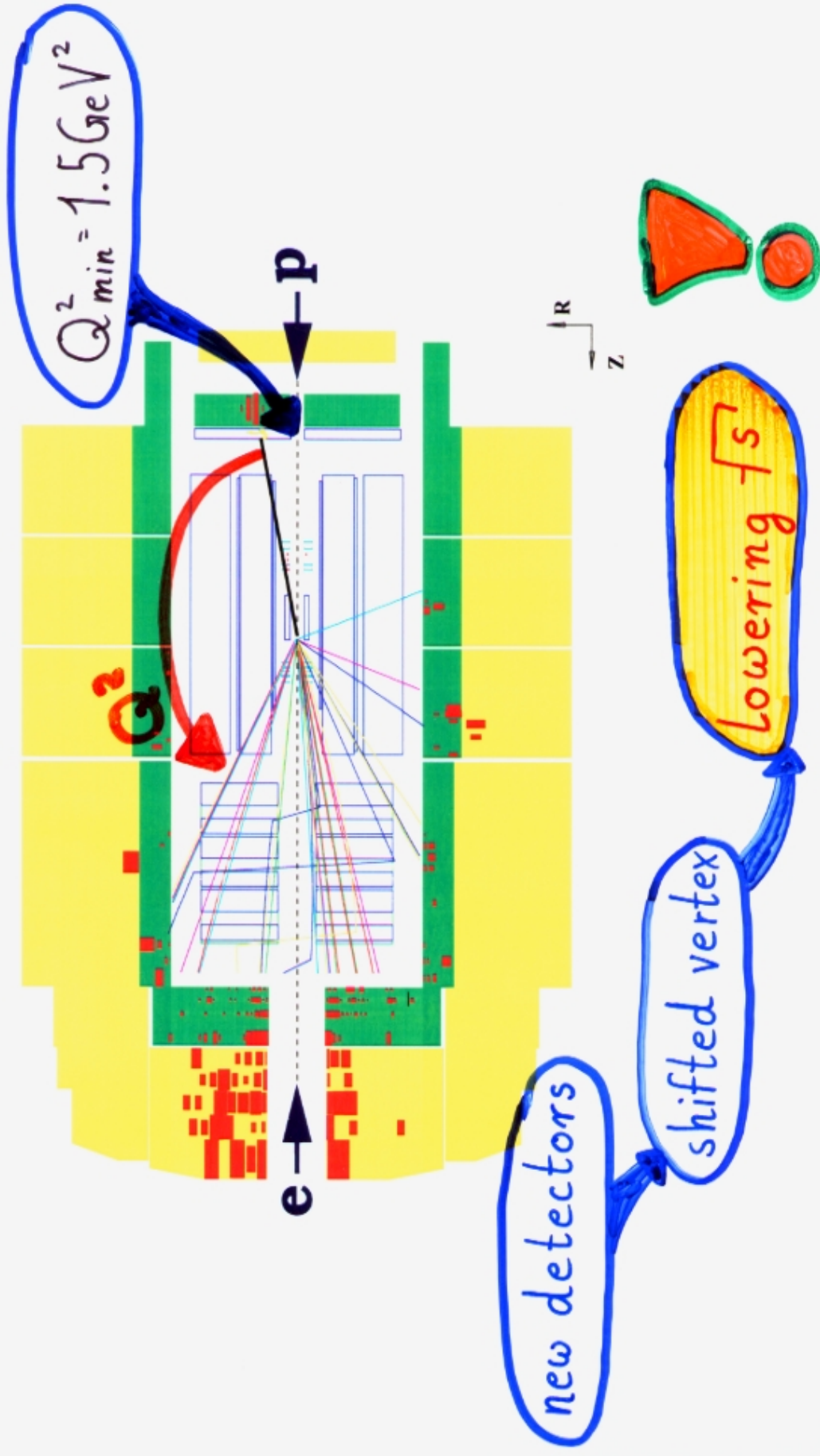
197



H1 9697 $F_2(x, Q^2)$

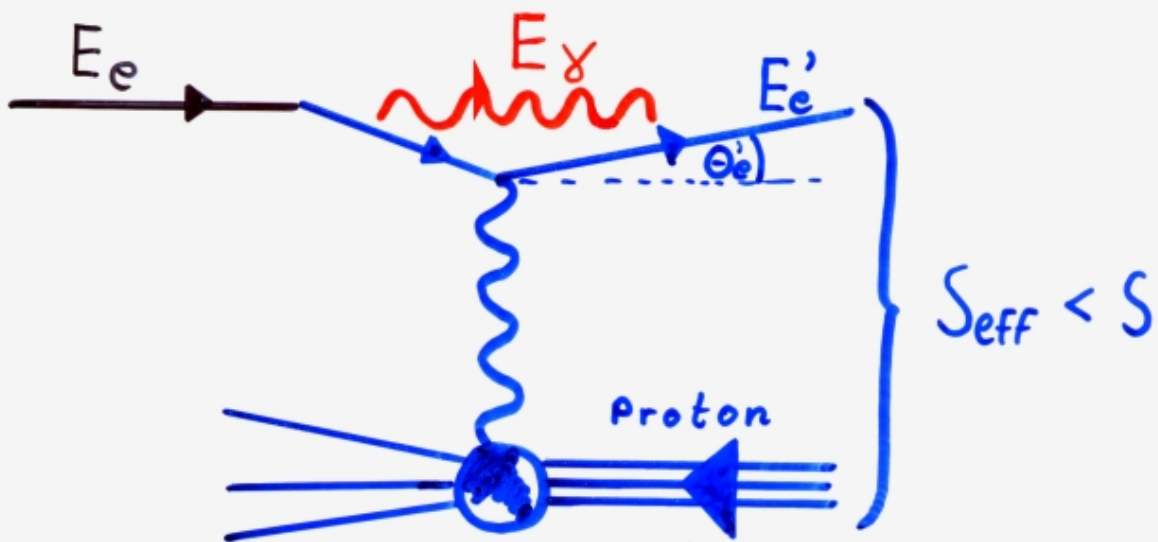


Detector Acceptance $\leftrightarrow Q^2$



ISR - Events

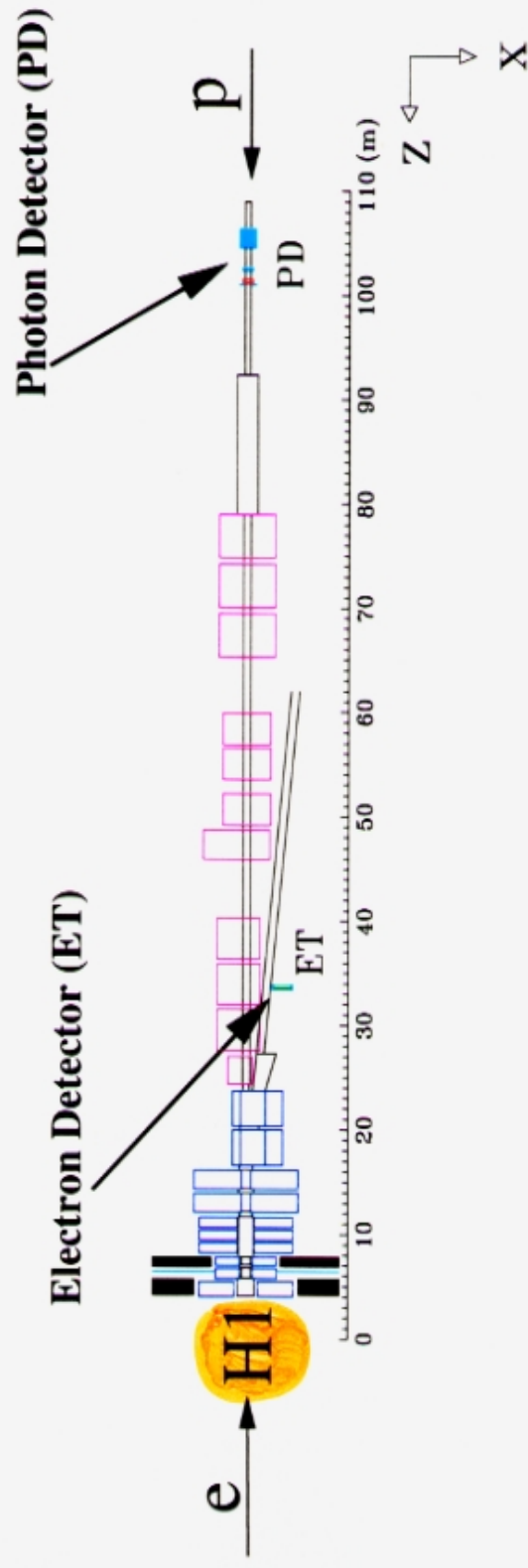
Initial State Radiation



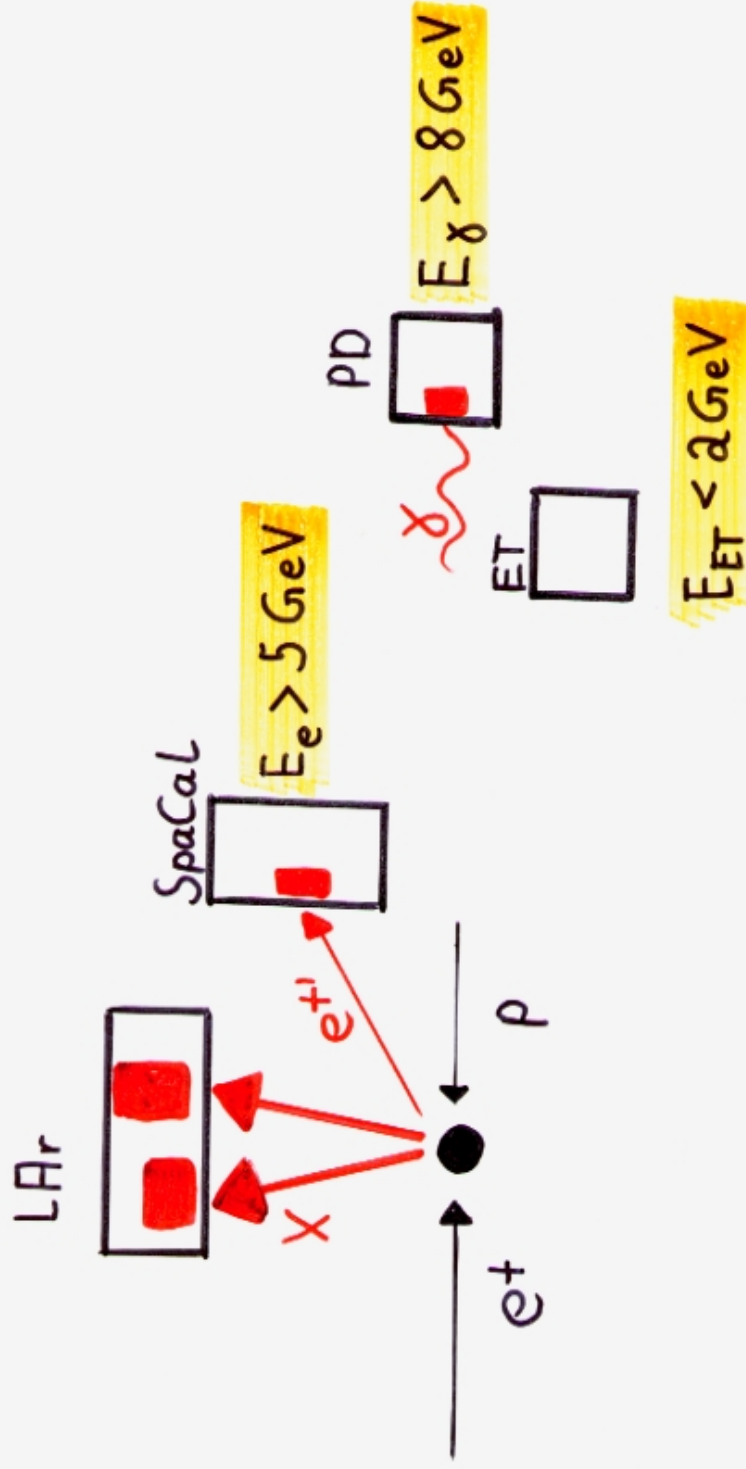
$$Q^2 = 4 E_e' \cdot (E_e - E_\gamma) \cdot \cos^2\left(\frac{\theta_e}{2}\right)$$

↪ smaller Q^2 !!

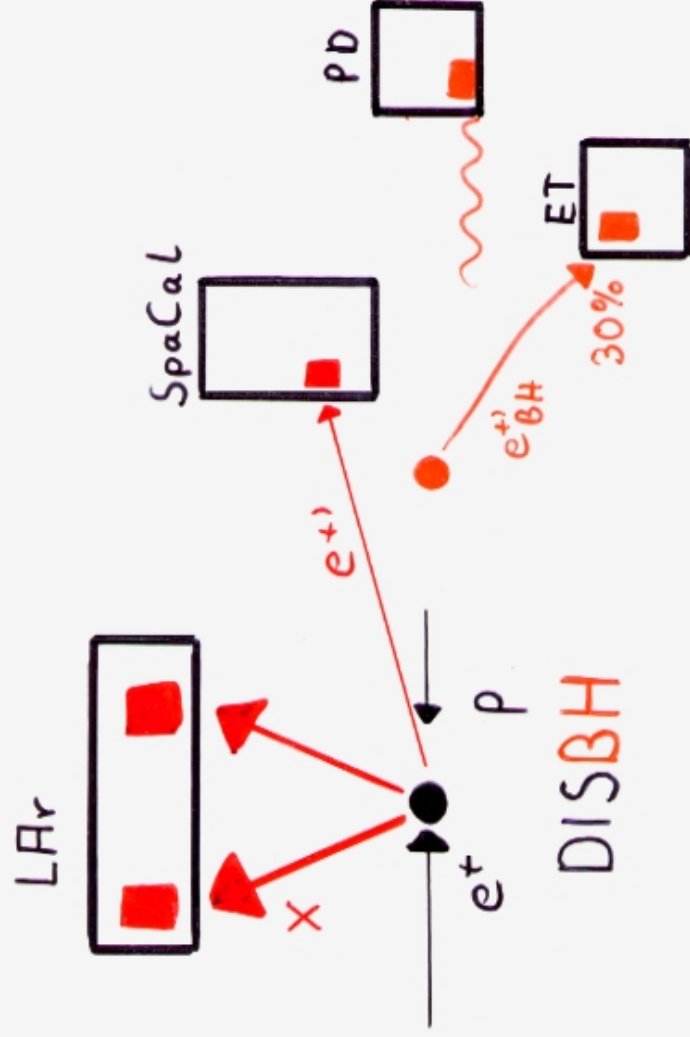
Luminosity System



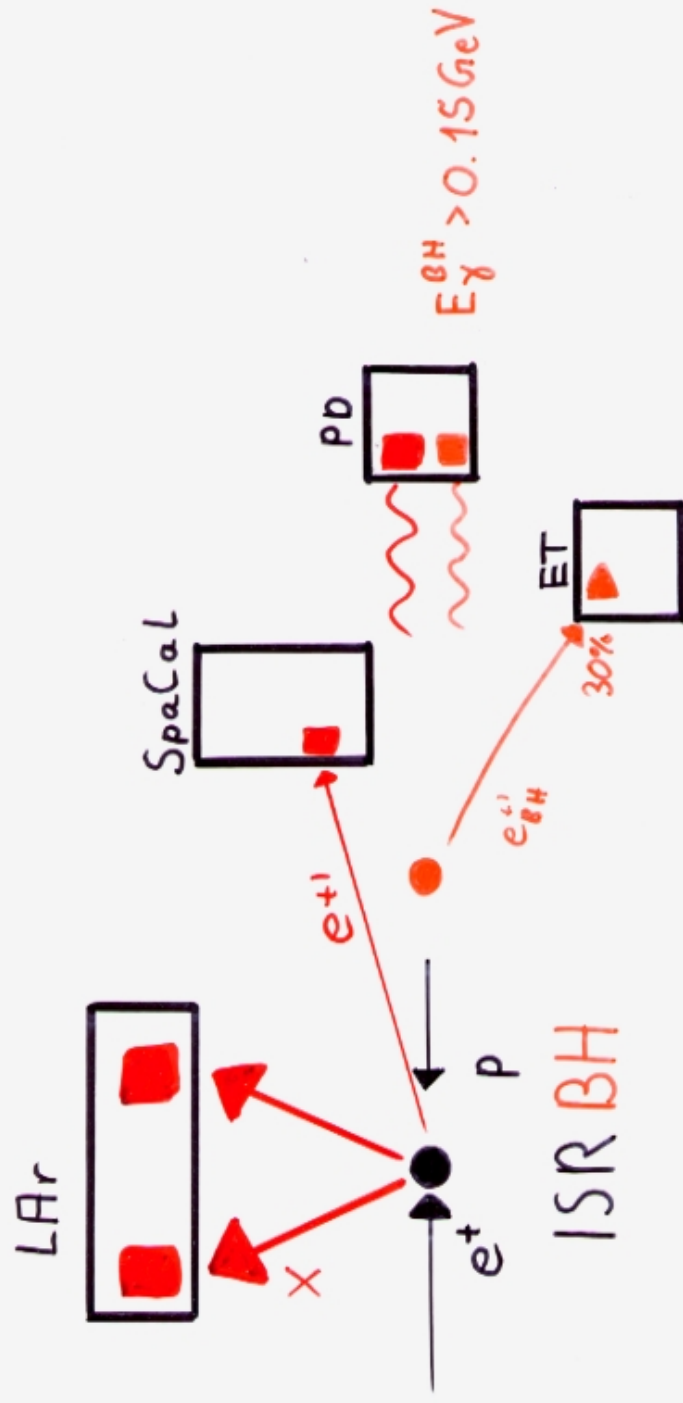
ISR Signature



BH-Overlap-Background

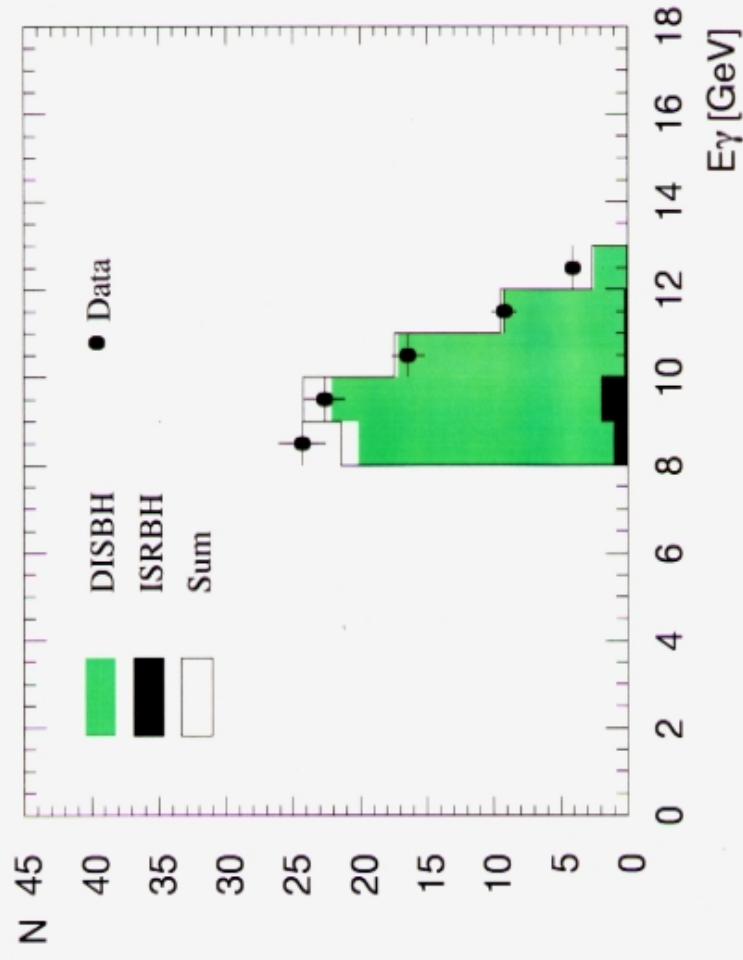


BH-Overlap on ISR



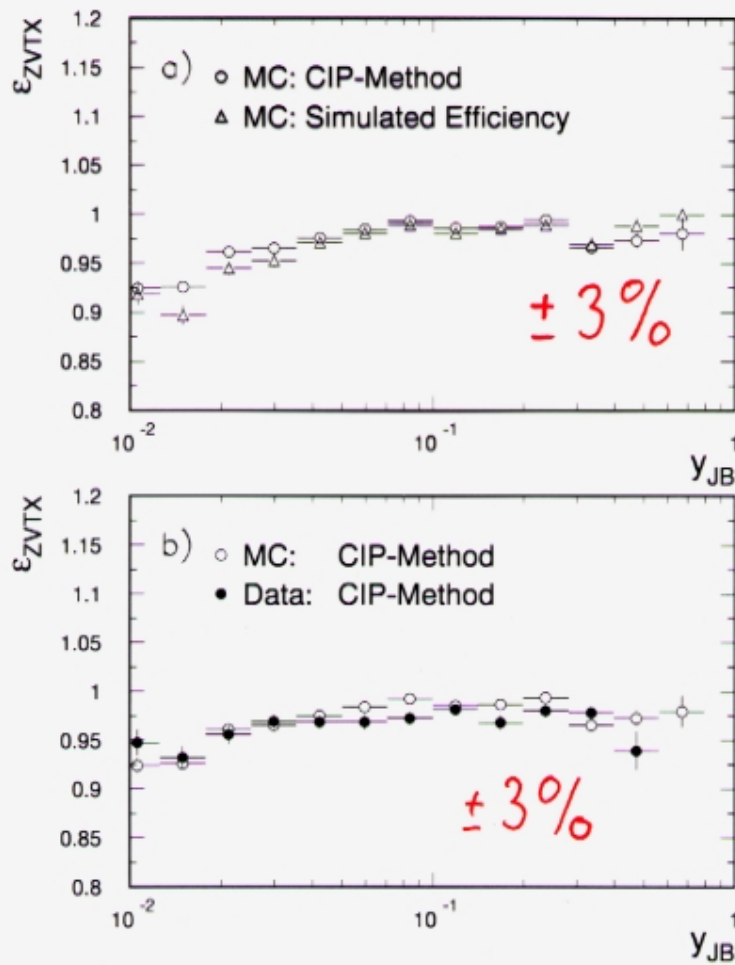
Background Simulation

$$E_T > 2 \text{ GeV}$$



good description

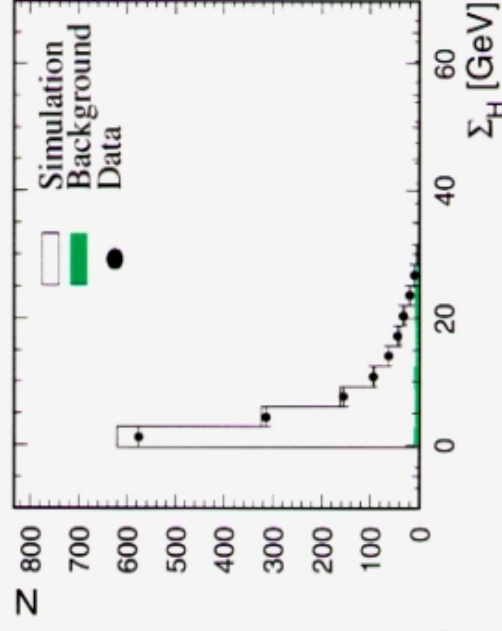
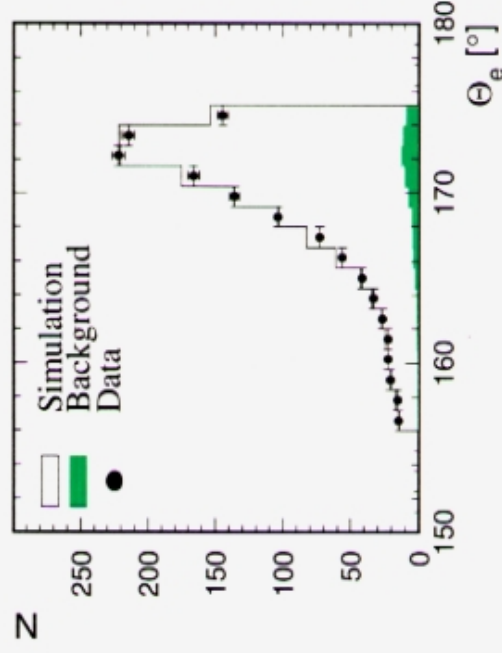
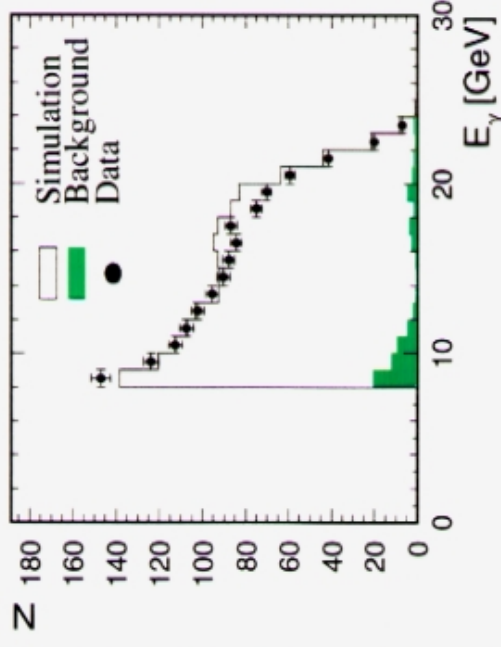
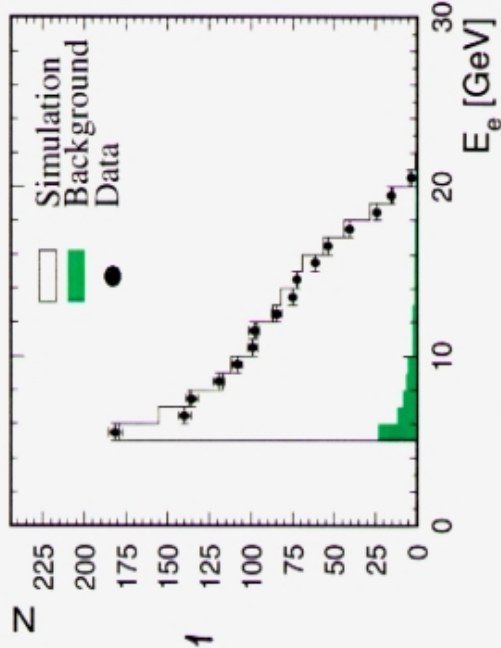
Vertexreconstruction Eff.



good description

Control Distributions

'97 ISR
 $\mathcal{L} = 11.1 \text{ pb}^{-1}$



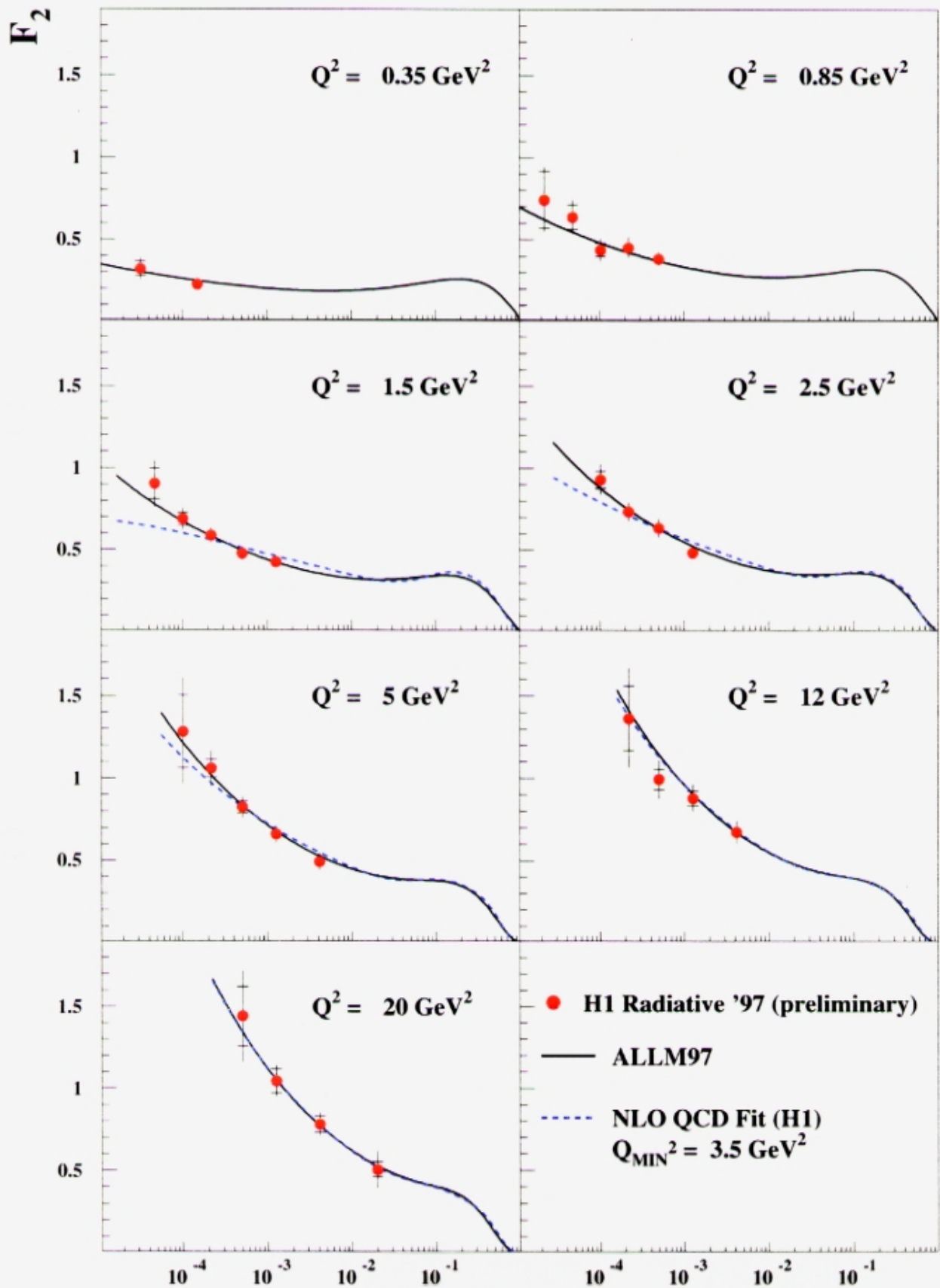
Systematics

Influence on $F_2(x, Q^2)$

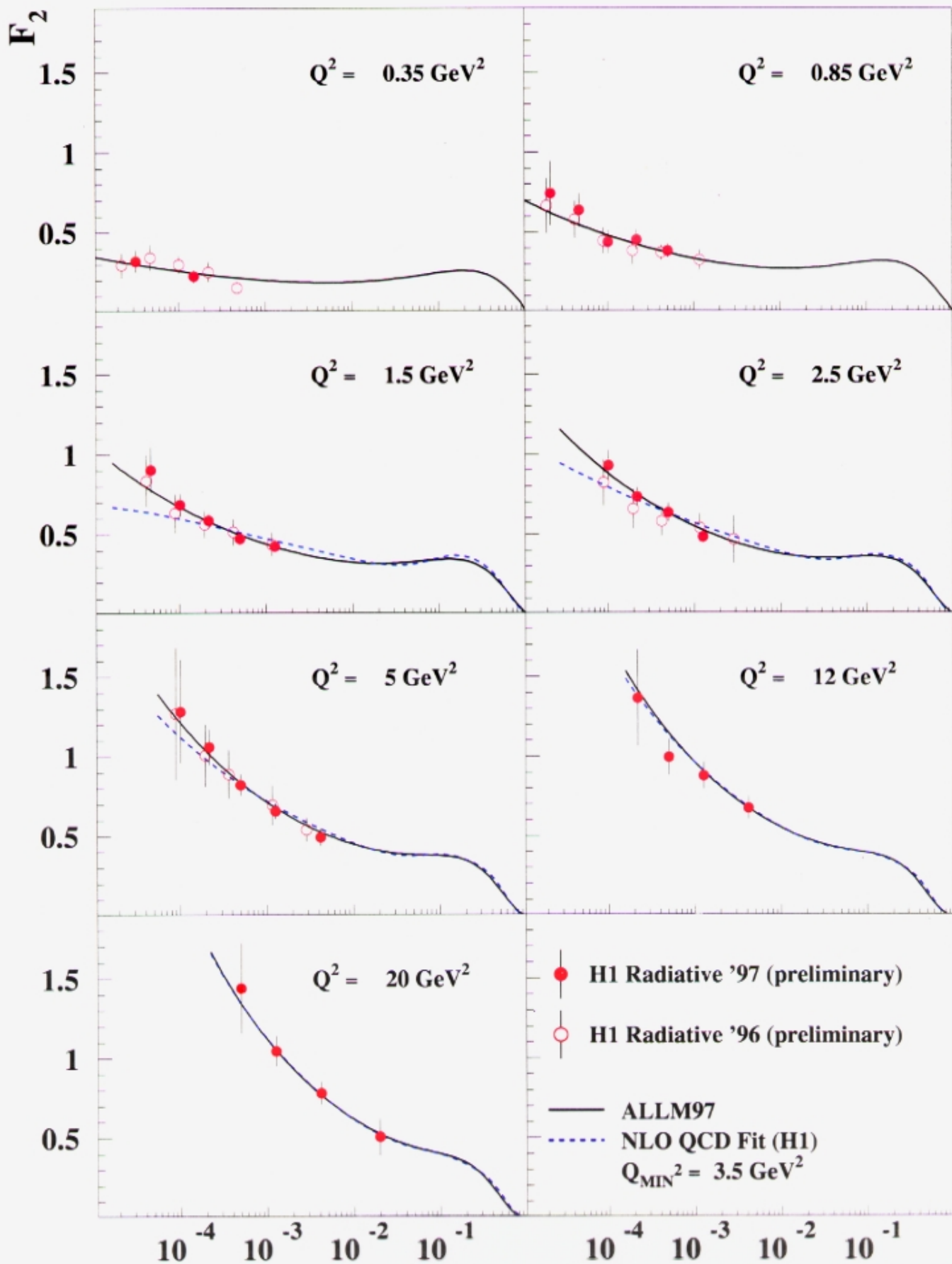


- Vertex reconstruction efficiency; ISR BH $\approx 4.9\%$
- hadr. energy scale $\approx 4\%$
- Positron energy scale; PD resolution $\approx 3\%$
- Photon energy scale $\approx 2.5\%$
- Θ_e $\approx 1.2\%$
- $F_2(x, Q^2)$ $\approx 0.8\%$
- Background $\approx 0.3 - 0.7\%$

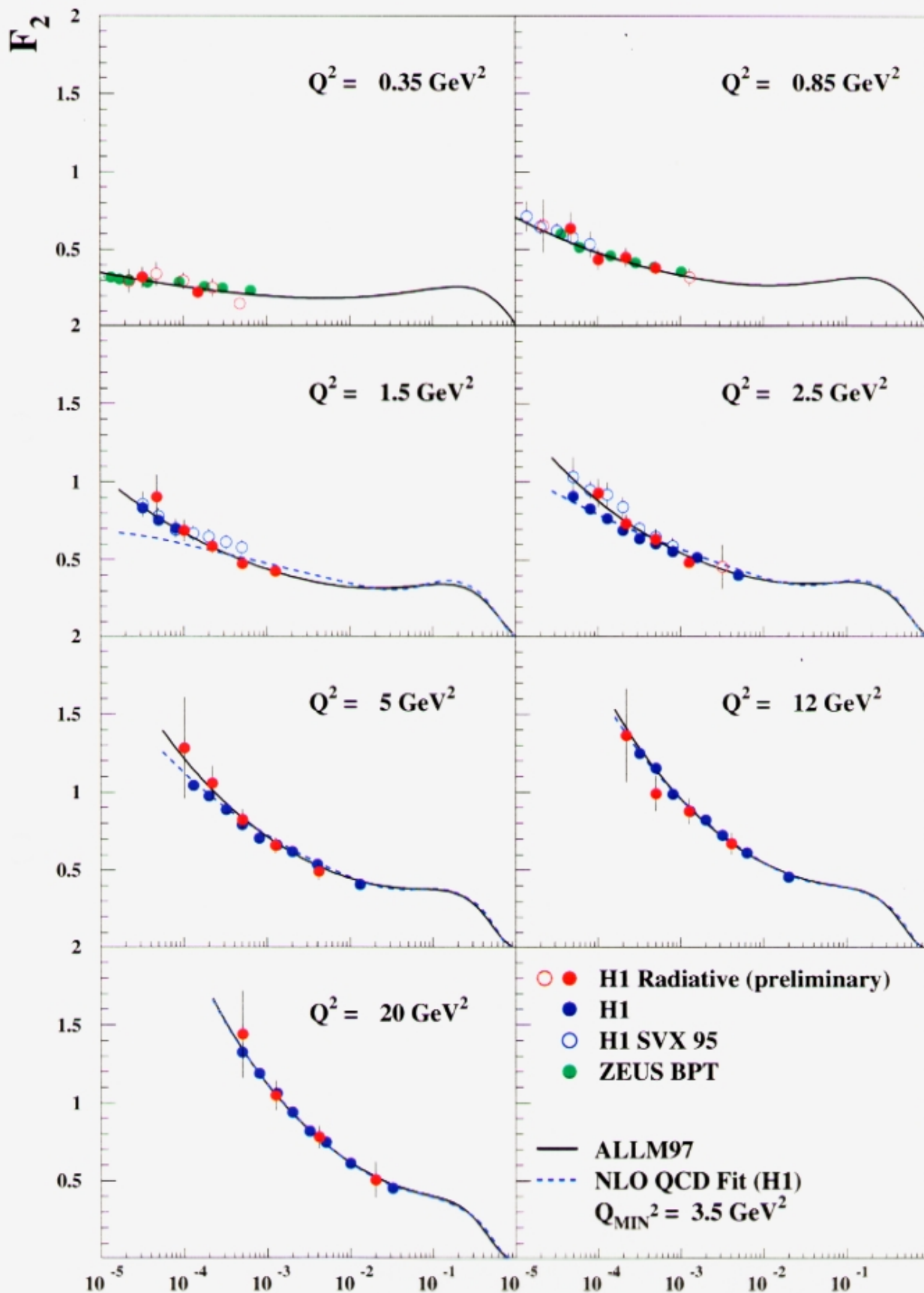
F_2 Radiative '97 (H1)

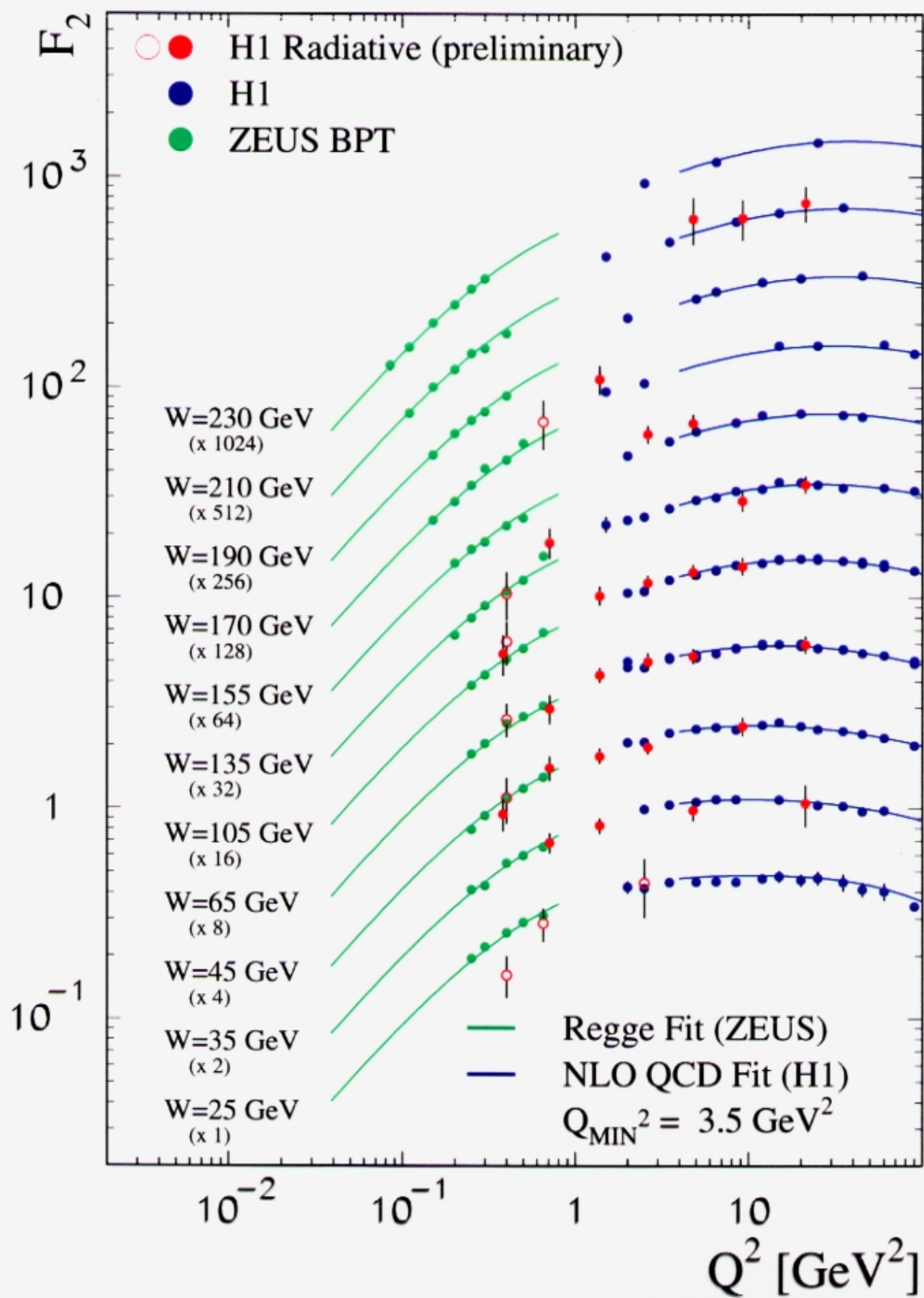


F_2 Radiative '96 & '97 (H1)



Radiative - Non Radiative





Conclusion

- '97 ISR data analysed: 11.1 pb^{-1}

$$0.28 \leq Q^2 \leq 34.64 \text{ GeV}^2$$

$$1.48\text{E-}05 < x < 4.69\text{E-}01$$

- $F_2(x, Q^2)$ measured with a
coherent data set in the
transition region

non perturbative \leftrightarrow perturbative

- Direct measurement of $F_L(x, Q^2)$;
(Outlook)