# SYSTEMATIC SHIFTS AND RADIATIVE CORRECTIONS

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→ UNFOLDING OF STRUCTUREFUNCTIONS

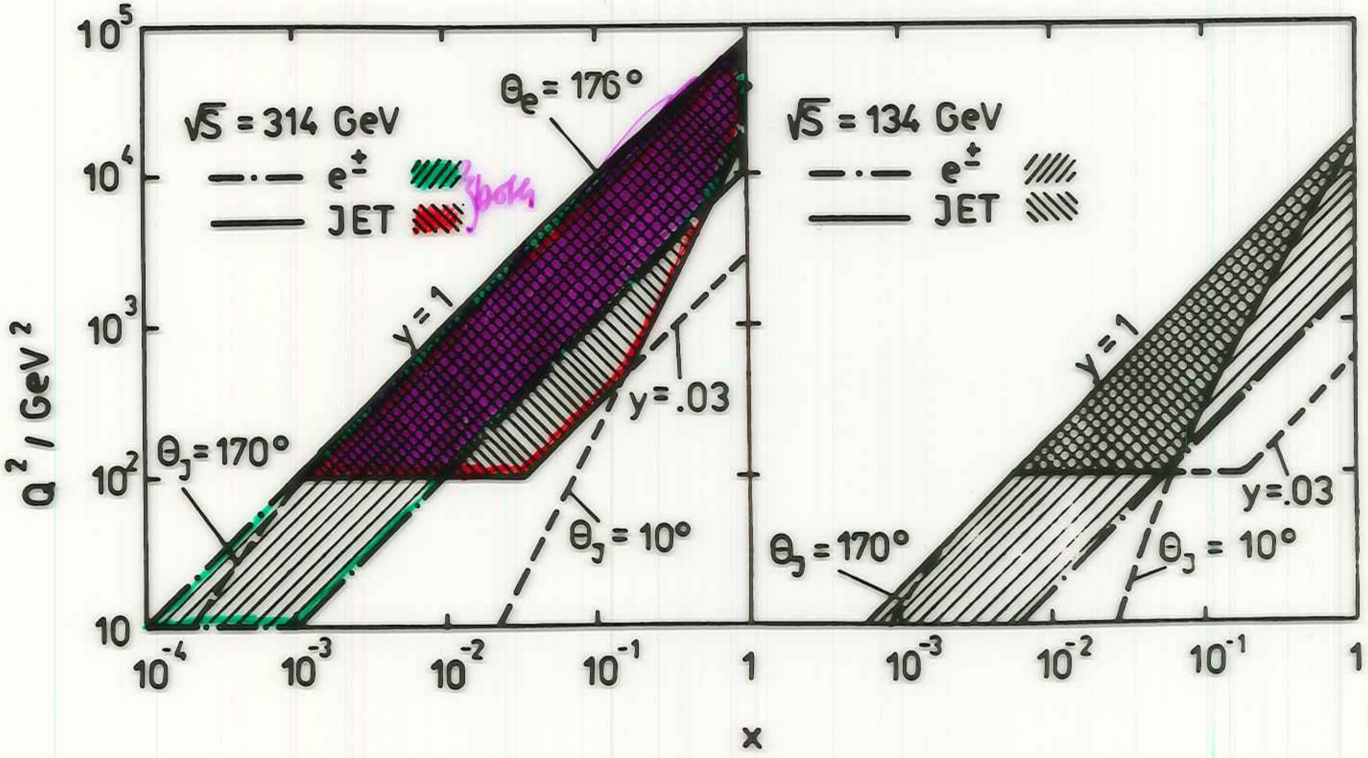
- $*(1+\varepsilon_{e,h})$
- R.C.

} INTRODUCE BIG CORRECTIONS $\delta(x,y)$.

→ DEPEND ON THE CHOICE OF THE MEASUREMENT OF KINEMATICAL VARIABLES.

→ FIND OPTIMAL CONDITIONS !

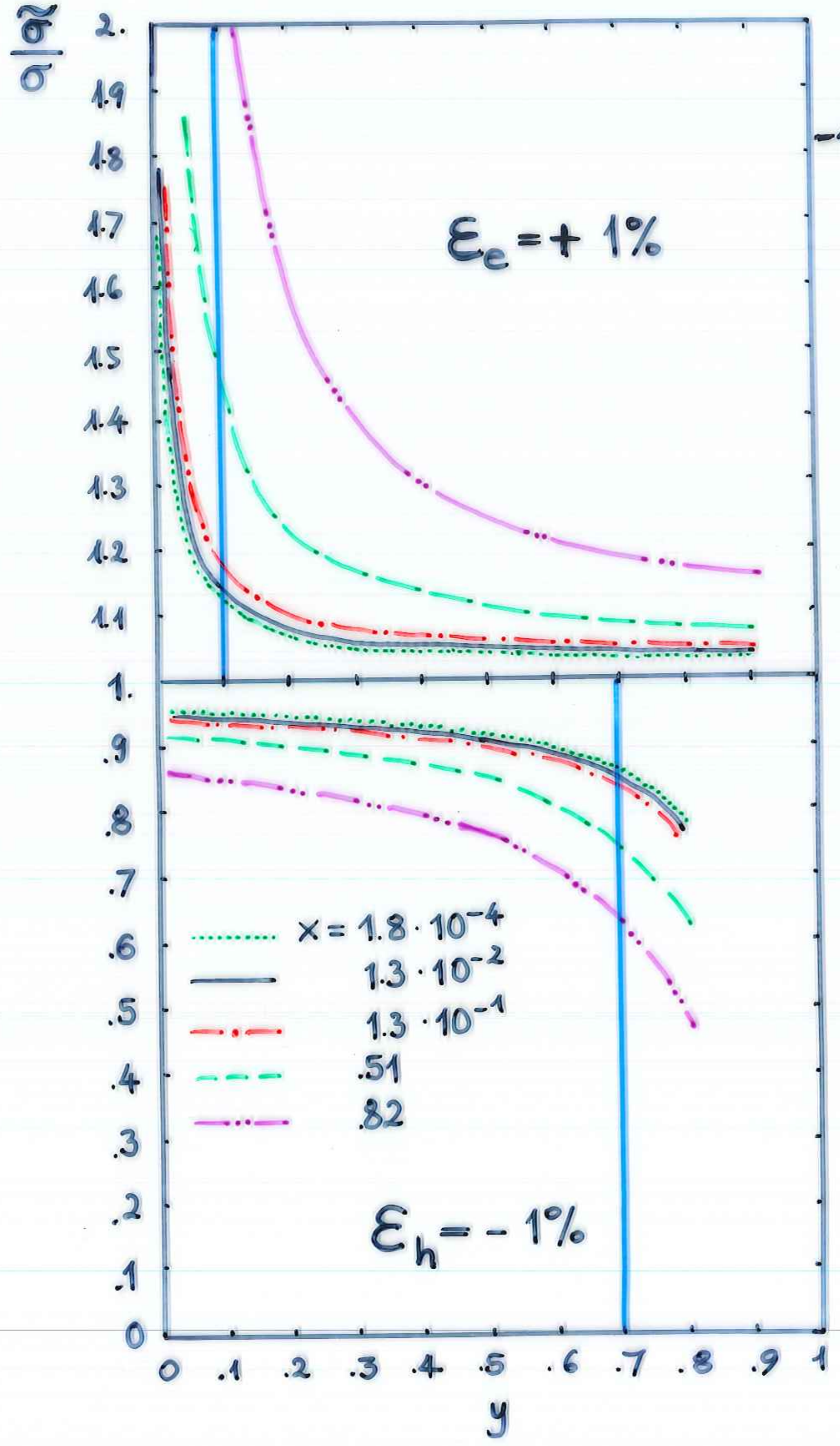
→ CROSS-DETERMINATION OF THE BULK-EFFECTS IN $\varepsilon_e, \varepsilon_h$.



√S = 314 GeV
e±
JET
both
θe = 176°
y = 1
y = .03
θJ = 170°
θJ = 10°
√S = 134 GeV
e±
JET
y = 1
y = .03
θJ = 170°
θJ = 10°
Q² / GeV²
10
10²
10³
10⁴
10⁵
10⁻⁴
10⁻³
10⁻²
10⁻¹
1
x

# SYSTEMATIC EFFECTS

- CALIBRATION UNCERTAINTIES OF THE e & h- CALORIMETERS




$$1 + \frac{\tilde{\sigma}}{\sigma} \sim \varepsilon_{e,h}, \quad \varepsilon_{e,h} \ll 1$$

$$\frac{\hat{x}}{x} \sim 1 + \frac{\varepsilon}{y}$$

$$\frac{\hat{y}}{y} \sim 1 + \varepsilon - \frac{\varepsilon}{y}$$

$$\frac{\hat{Q}^2}{Q^2} \sim (1+\varepsilon)$$

RC!

$$\frac{\hat{x}}{x} \sim 1 + \frac{\varepsilon}{1-y}$$

$$\frac{\hat{y}}{y} \sim 1 + \varepsilon$$

$$\frac{\hat{Q}^2}{Q^2} \sim 1 + \varepsilon \, \frac{2-y}{1-y}$$

MAY ONE USE THIS DEPENDENCE FOR A 'GLOBAL' CROSS-CALIBRATION ?

# SYSTEMATIC EFFECTS

$$\hat{E}_e = E_e (1+\varepsilon_e)$$

$$\hat{E}_H = E_H (1+\varepsilon_h)$$

$\varepsilon_e, \varepsilon_h \ll 1$

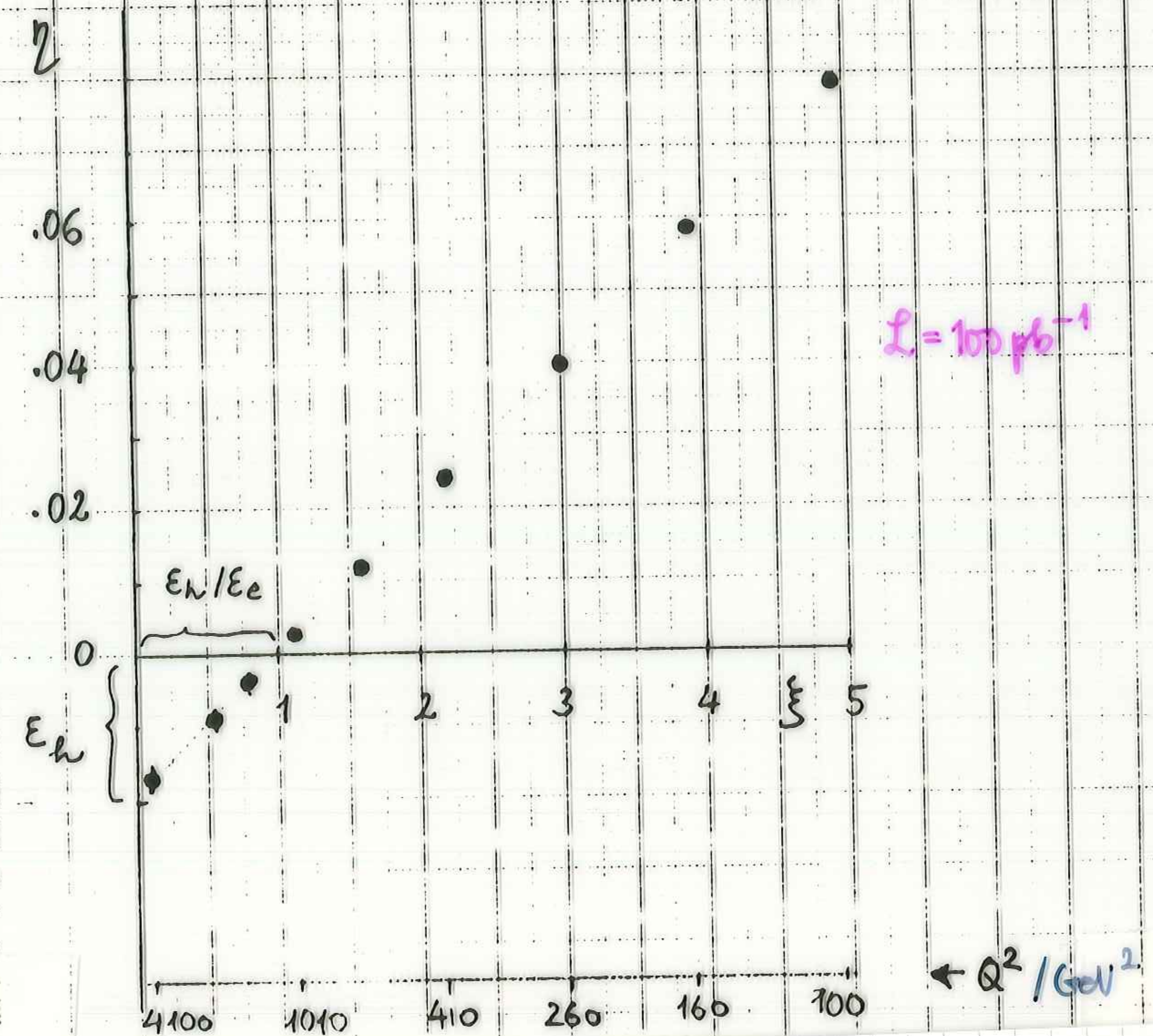
INTRODUCES $x, y$ - DEPENDENCE:

$$\hat{x}_e = \frac{x}{1-\varepsilon_e/(1+\varepsilon_e)y} \qquad \hat{x}_H = x \frac{(1+\varepsilon_H)(1-y)}{1-y(1+\varepsilon_H)}$$

$$\hat{Q}^2_e = Q^2(1+\varepsilon_e) \qquad \hat{Q}^2_H = Q^2 \frac{(1+\varepsilon_H)^2(1-y)}{1-y(1+\varepsilon_H)}$$

$$\hat{y}_e = y - \varepsilon_e(1-y) \qquad \hat{y}_H = y(1+\varepsilon_H)$$

$$\left(1-\frac{1}{r}\right)\frac{1}{\delta_h} = \varepsilon_e \cdot \frac{\delta_e}{r\,\delta_h} - \varepsilon_h = \eta = \varepsilon_e \cdot \xi - \varepsilon_h$$




x = 0.05

$$r = \frac{\sigma_e}{\sigma_h} \approx \frac{1+\varepsilon_e\cdot\delta_e}{1+\varepsilon_h\cdot\delta_h}$$ , $\delta_e, \delta_h$ universal, calculable for given binning and small $\varepsilon$

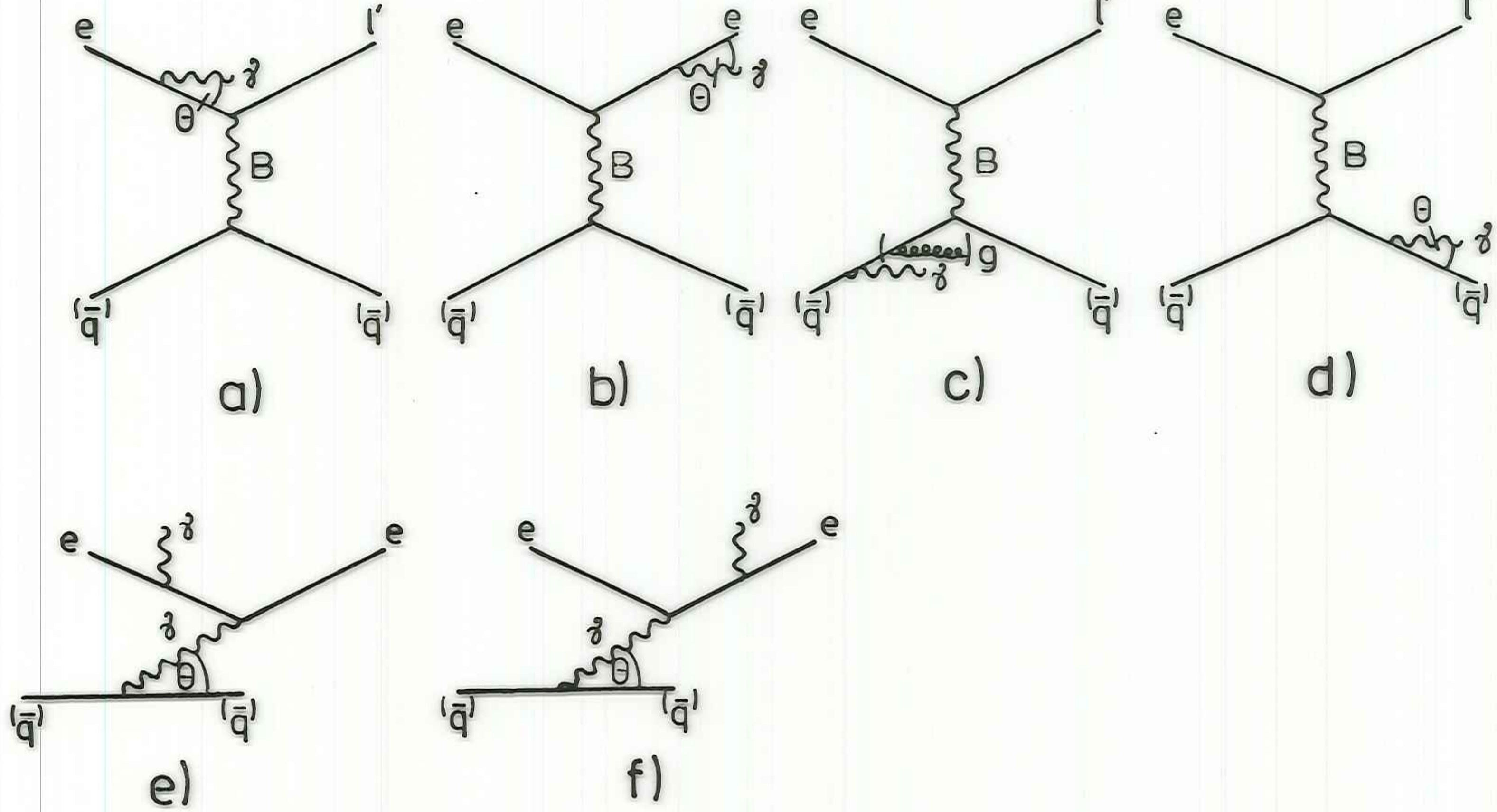
# RADIATIVE CORRECTIONS

- INCLUSIVE: $\gamma$- INTEGRATED OUT
  - DEPEND ON DEFINITION OF KINEM. VARIABLES:
    - $x, Q^2$ — e-measurement
    - $x, Q^2$ — h-measurement
    - $y_h, Q^2_e$. $\longrightarrow$ SYSTEMATIC SHIFTS

      $*(1+\varepsilon_e)$ ; $*(1+\varepsilon_h)$

      $\longrightarrow$ SIMPLE CONSTANT.

- WHICH DIAGRAMS DO EFFECTIVELY CONTRIBUTE?
- HOW IS THE DEPENDENCE $\delta_{\substack{CC\\NC}}(x,y)$ FOR DIFFERENT MEASUREMENTS?


e
l′
θ
γ
B
(q̄)
a)
e
e
θ
γ
B
(q̄)
b)
e
l′
B
g
γ
(q̄)
c)
e
l′
B
θ
γ
(q̄)
d)
e
γ
e
γ
θ
(q̄)
e)
e
γ
e
γ
θ
(q̄)
f)

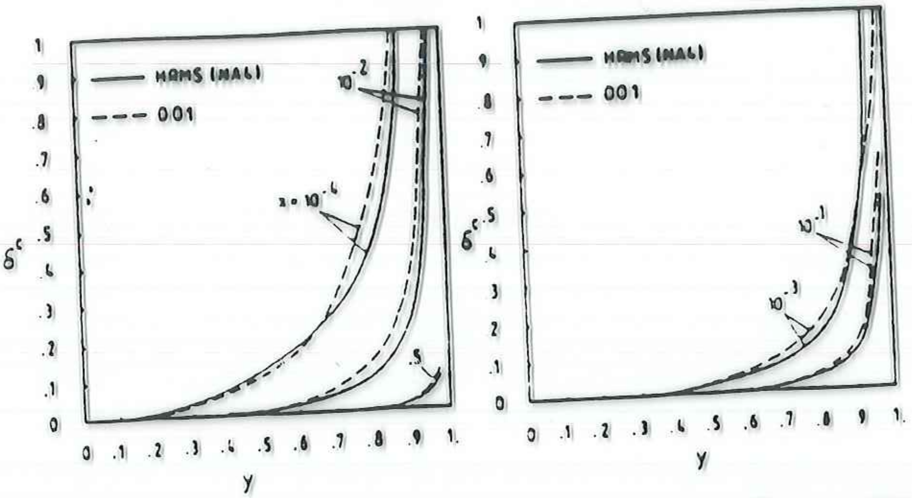



**Figure 1:** Ratio of the Compton part to the Born cross section for various values of $x$ and the parton distributions from [5,6].

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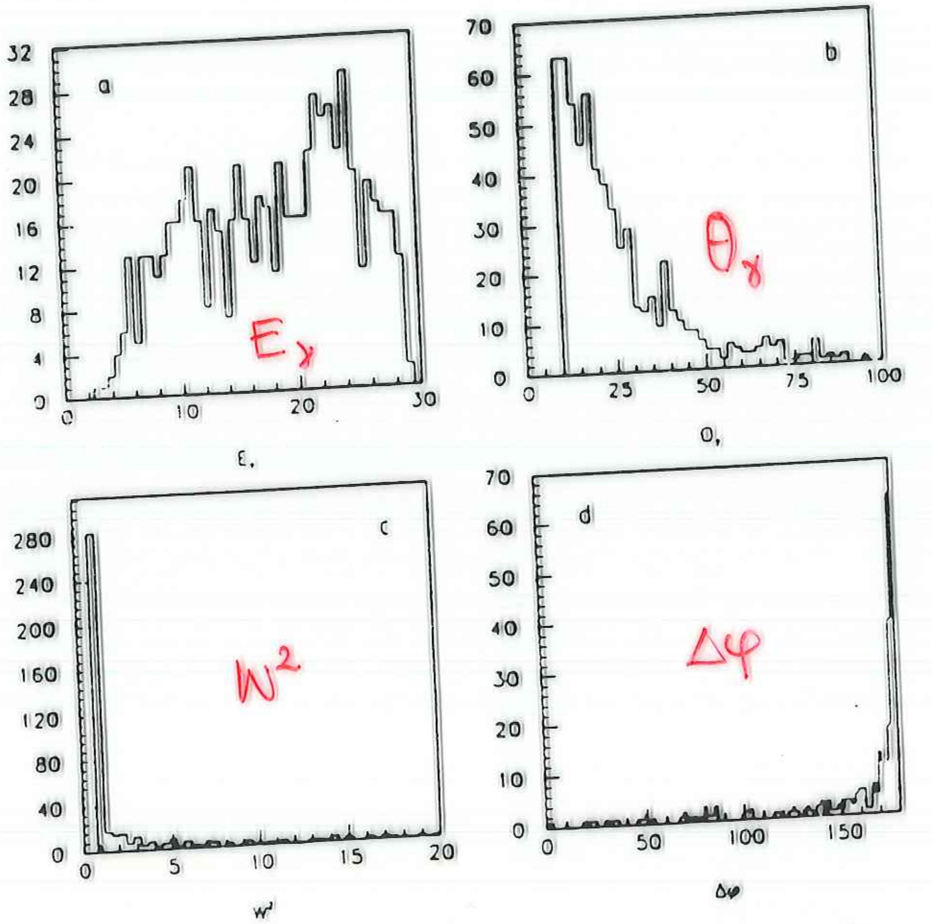


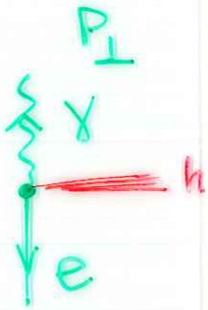




**Figure 2:** Distribution of the Compton events versus the energy (a) and the polar angle (b) of the photon, the hadronic final state mass (c), and the difference of azimuthal angles of the electron and the photons (d).

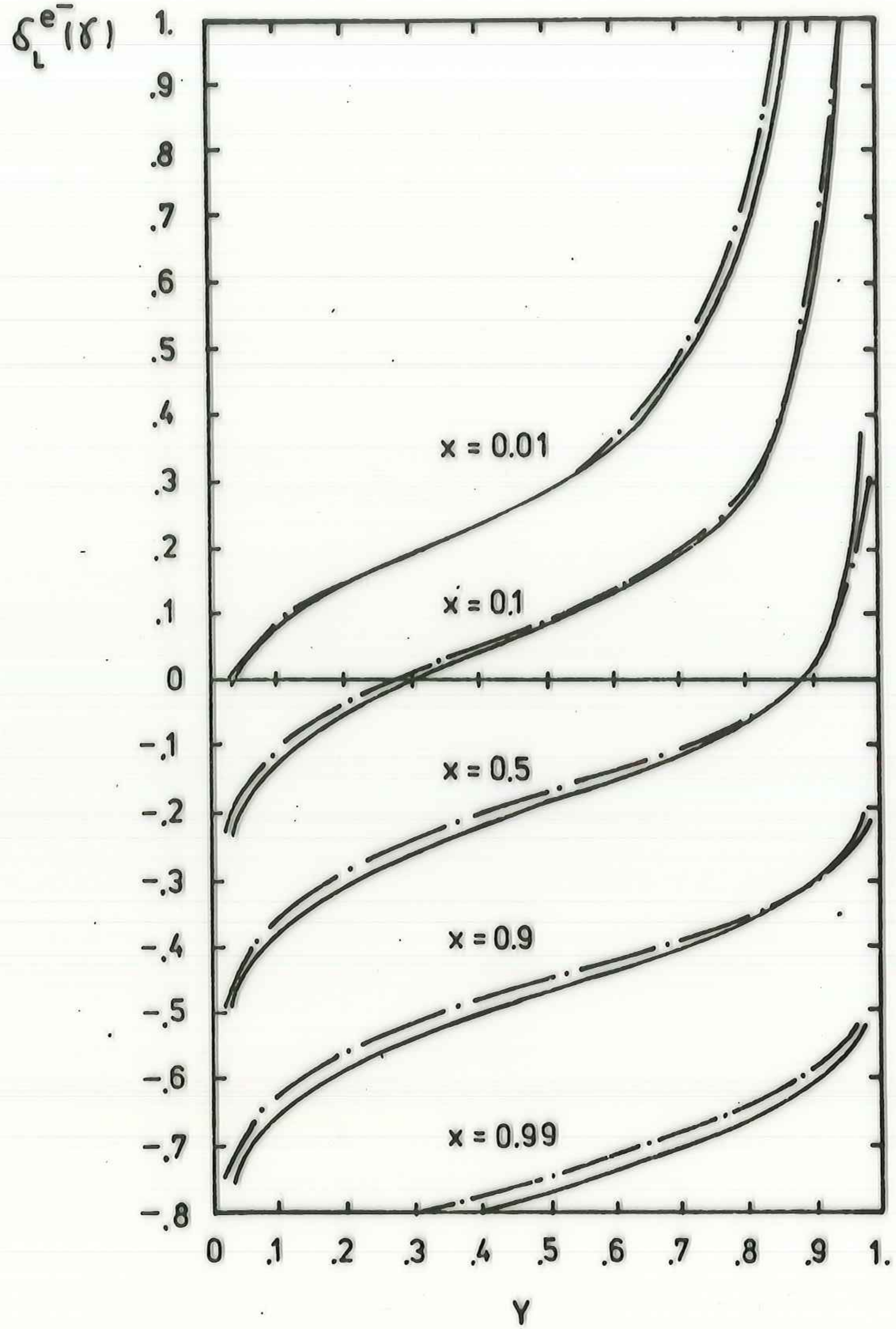
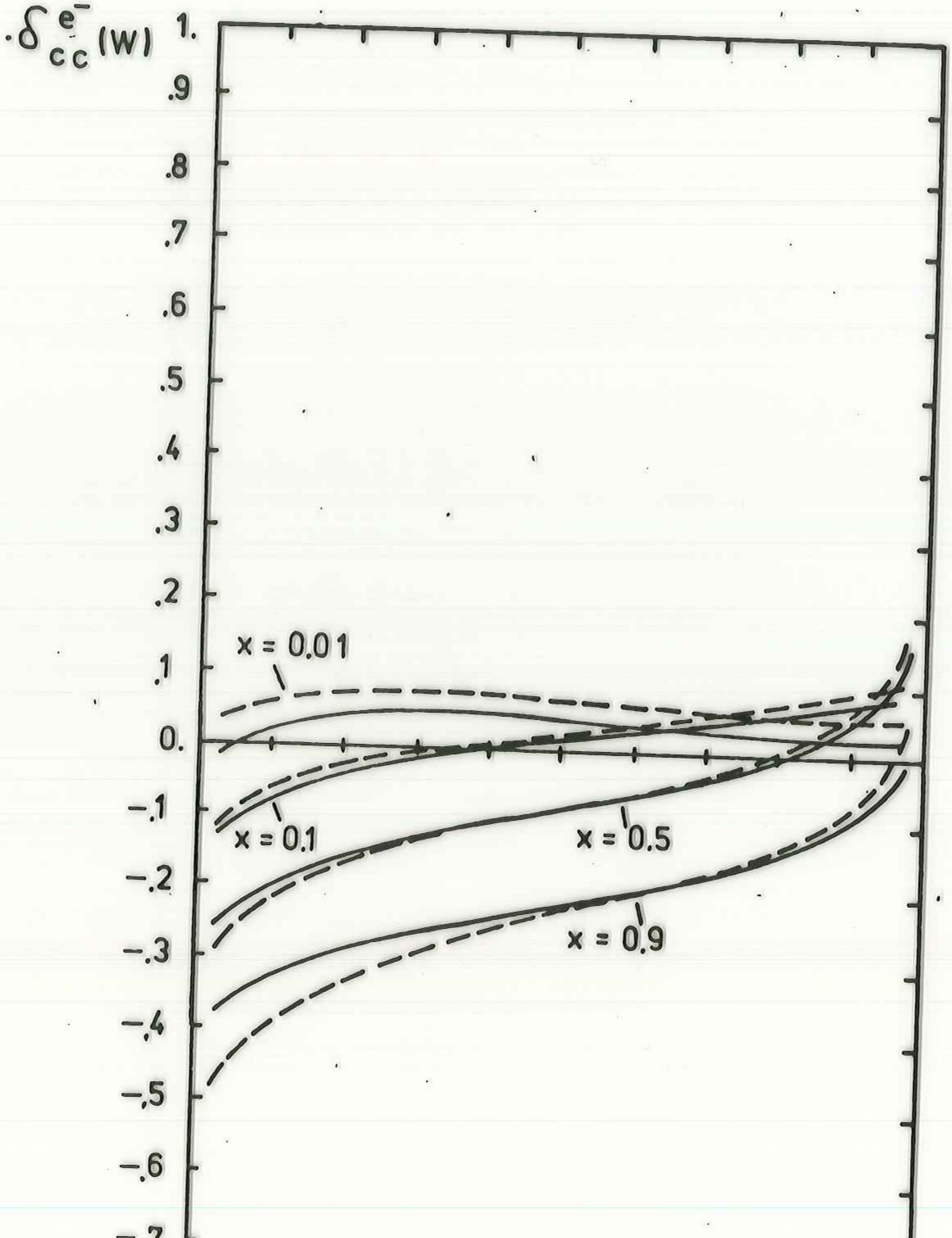

$\delta_L^{e^-}(Y)$
1.
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
−.1
−.2
−.3
−.4
−.5
−.6
−.7
−.8
x = 0.01
x = 0.1
x = 0.5
x = 0.9
x = 0.99
0
.1
.2
.3
.4
.5
.6
.7
.8
.9
1.
Y

Figure 1a



$\delta^{e^-}_{cc}(W)$
1.
.9
.8
.7
.6
.5
.4
.3
.2
.1
0.
−.1
−.2
−.3
−.4
−.5
−.6
−.7
−.8
x = 0.01
x = 0.1
x = 0.5
x = 0.9
0
.1
.2
.3
.4
.5
.6
.7
.8
.9
1.
Y


Figure 3

JET-
MEASUREMENT

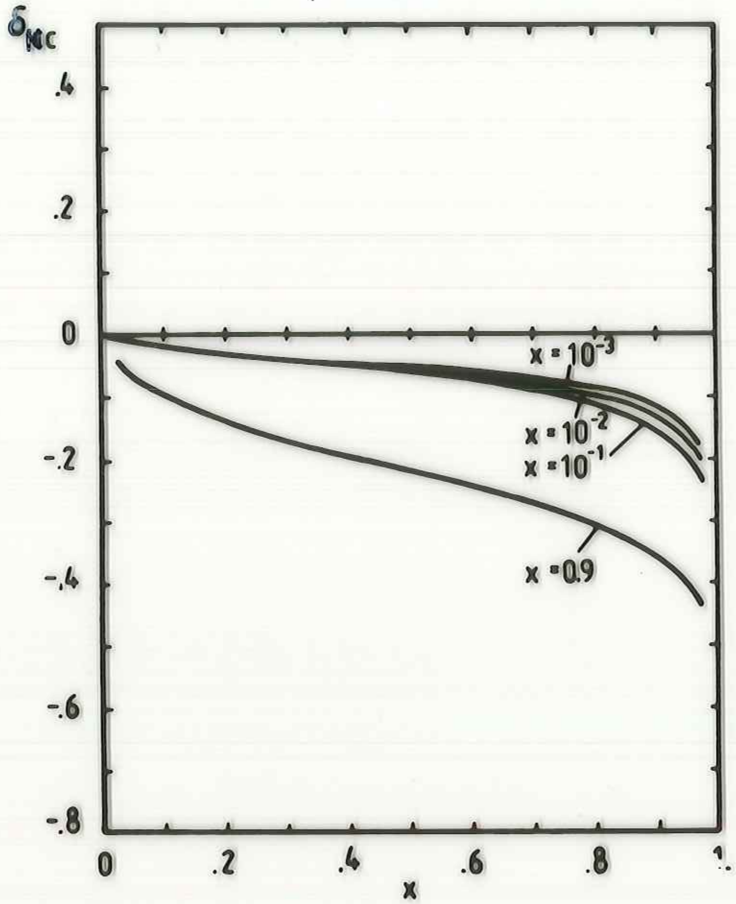



Fig. 2a

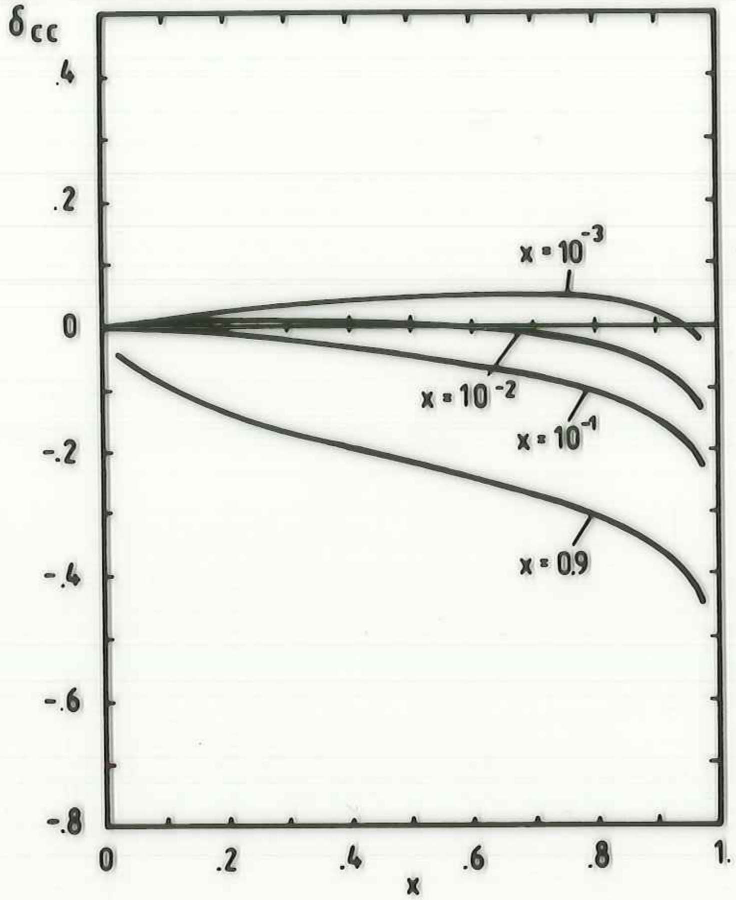



Fig. 2b

JET - MEASUREMENT

$$Q_e^2 = -(p_e - p_e')^2 \; ; \quad y_H = \frac{P_p\,(p_H - P_p)}{P_p \cdot k} = \sum_h \frac{E_h - p_{zh}}{2E_e}$$

$$y_h \to y/z, \quad Q^2 \to Q^2 z, \quad x \to x \cdot z, \quad s \to s \cdot z$$

$$\begin{vmatrix} \partial\hat{x}/\partial x & \partial\hat{x}/\partial y \\ \partial\hat{y}/\partial x & \partial\hat{y}/\partial y \end{vmatrix} = 1 \qquad y < z < 1$$