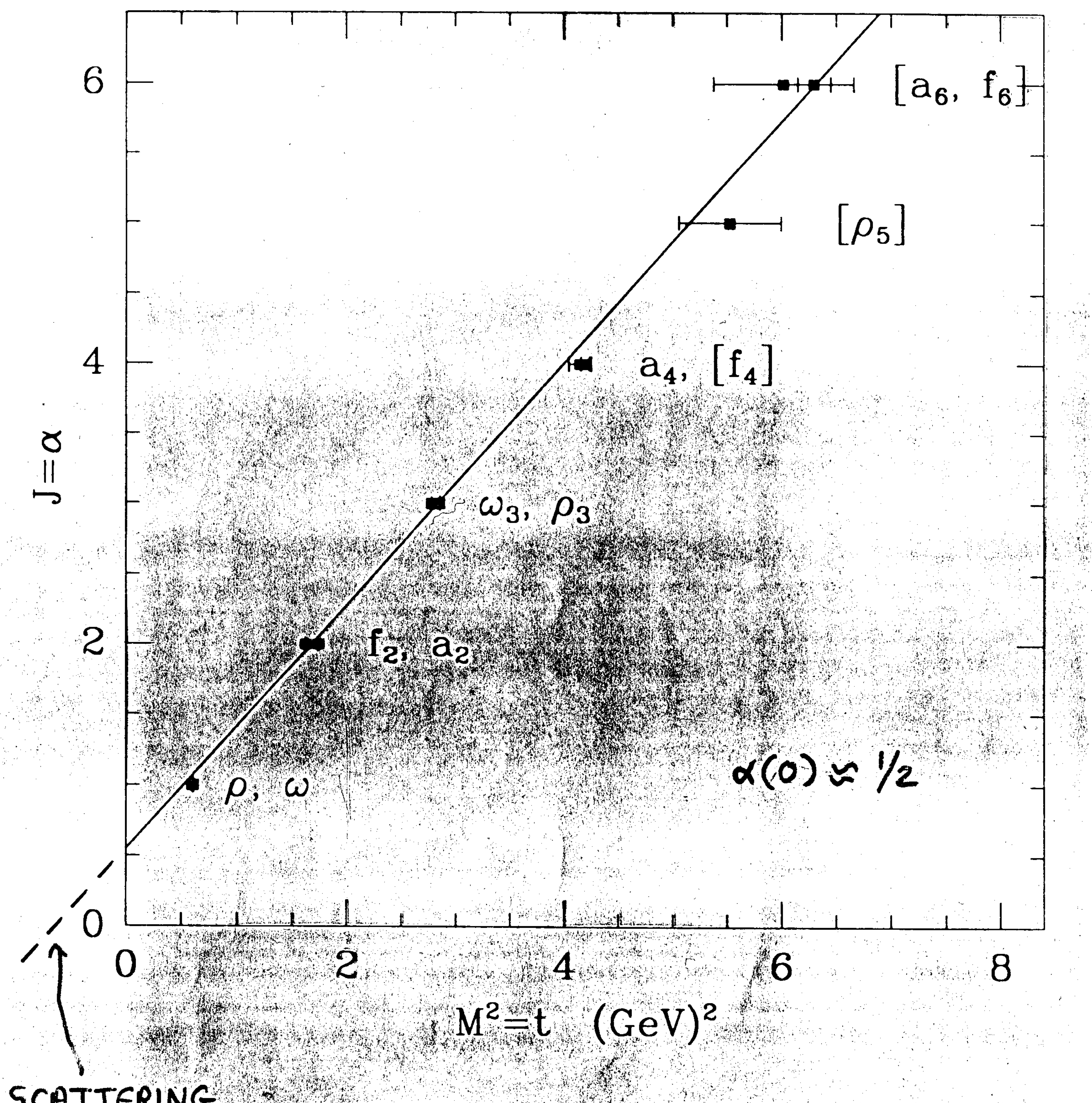
WHAT IS DUALITY?
WHITHER DUALITY?

LANDSHOFF

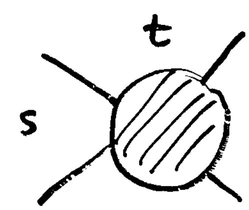


$\sigma^{TOT} \sim s^{\alpha(0)-1}$

VENEZIANO MODEL

LINEAR TRAJECTORY $\alpha(s) = \alpha_0 + \alpha' s$

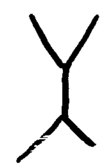
$$V(s,t) = \beta \frac{\Gamma(-\alpha(s))\,\Gamma(-\alpha(t))}{\Gamma(-\alpha(s)-\alpha(t))}$$



POLES AT VALUES OF
s FOR WHICH
$\alpha(s) = n$

RESIDUE IS POLYNOMIAL DEGREE n IN t
AND SO IN $\cos\theta$

SIMILARLY POLES AT VALUES OF t
FOR WHICH $\alpha(t) = n$



BUT THE s AND t POLES DO
NOT MULTIPLY TOGETHER

FROM STIRLING'S FORMULA, FOR LARGE s
AT FIXED t

$$V(s,t) \sim \beta\,\Gamma(-\alpha(t))\,(-\alpha' s)^{\alpha(t)}$$

REGGE BEHAVIOUR : EFFECT OF INFINITELY MANY
t -CHANNEL EXCHANGES

DUALITY : THIS IS THE EXTRAPOLATION TO
HIGH ENERGY OF THE s- CHANNEL POLES

PLOT BY GAURON & NICOLESCU

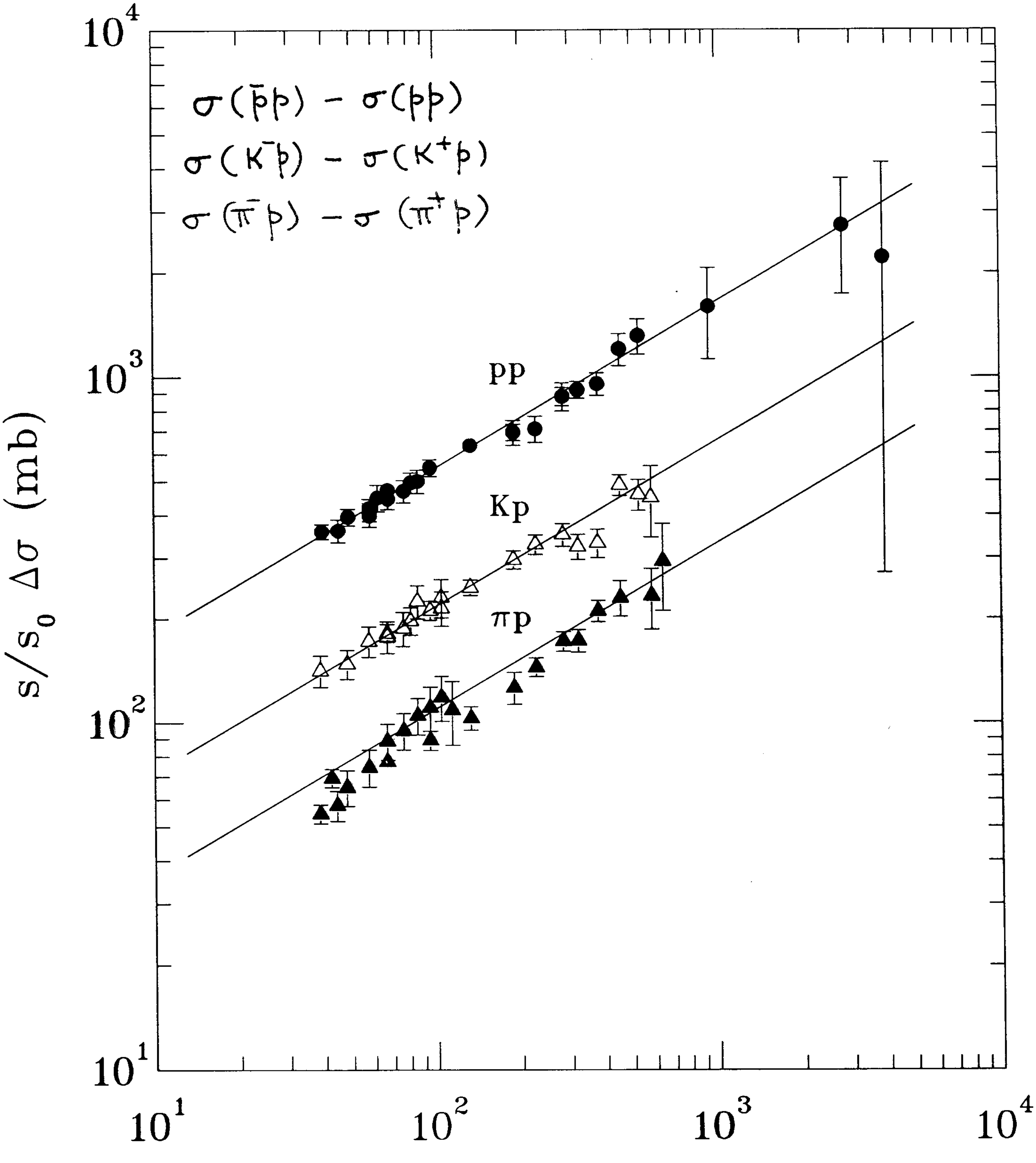
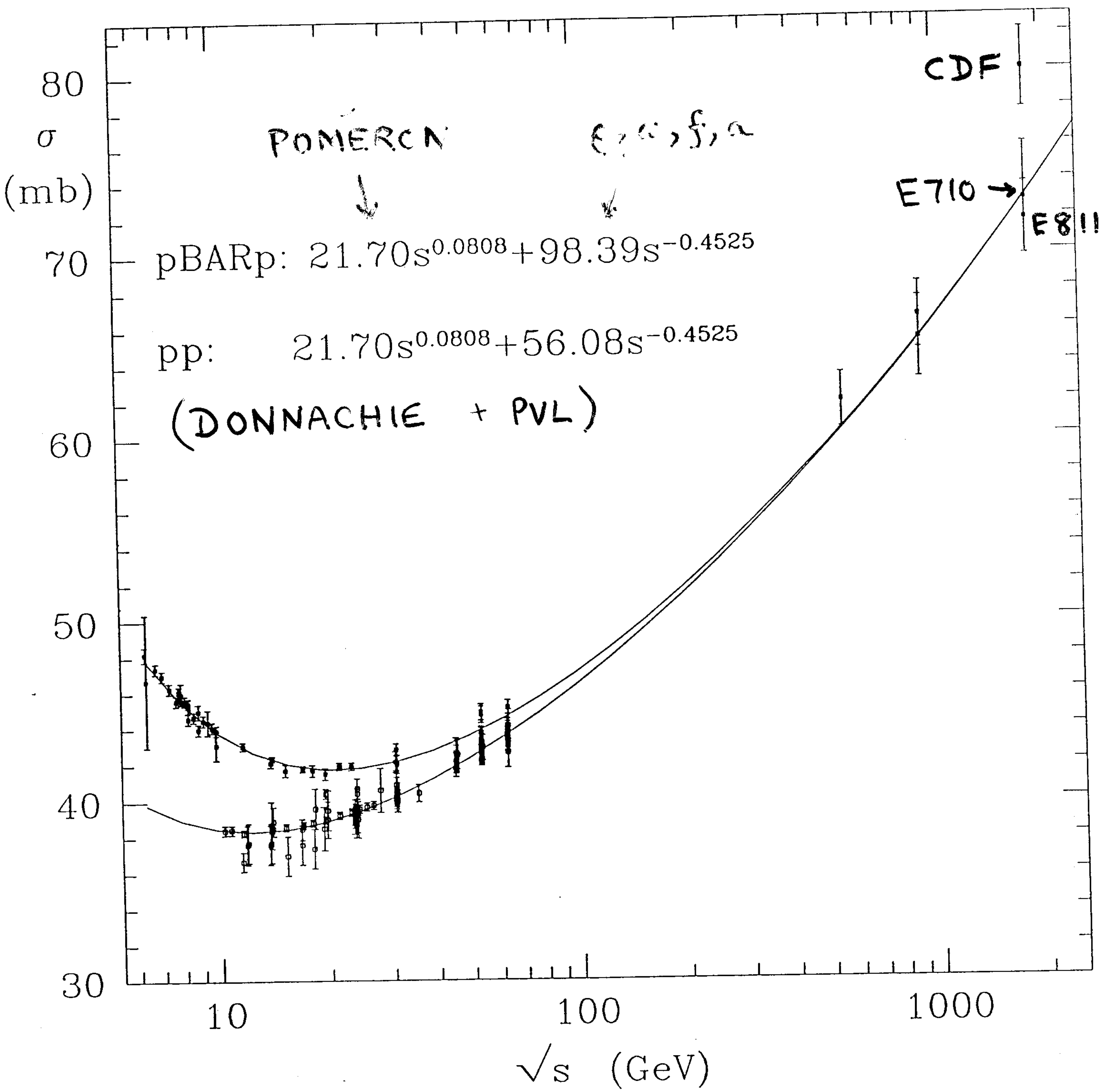
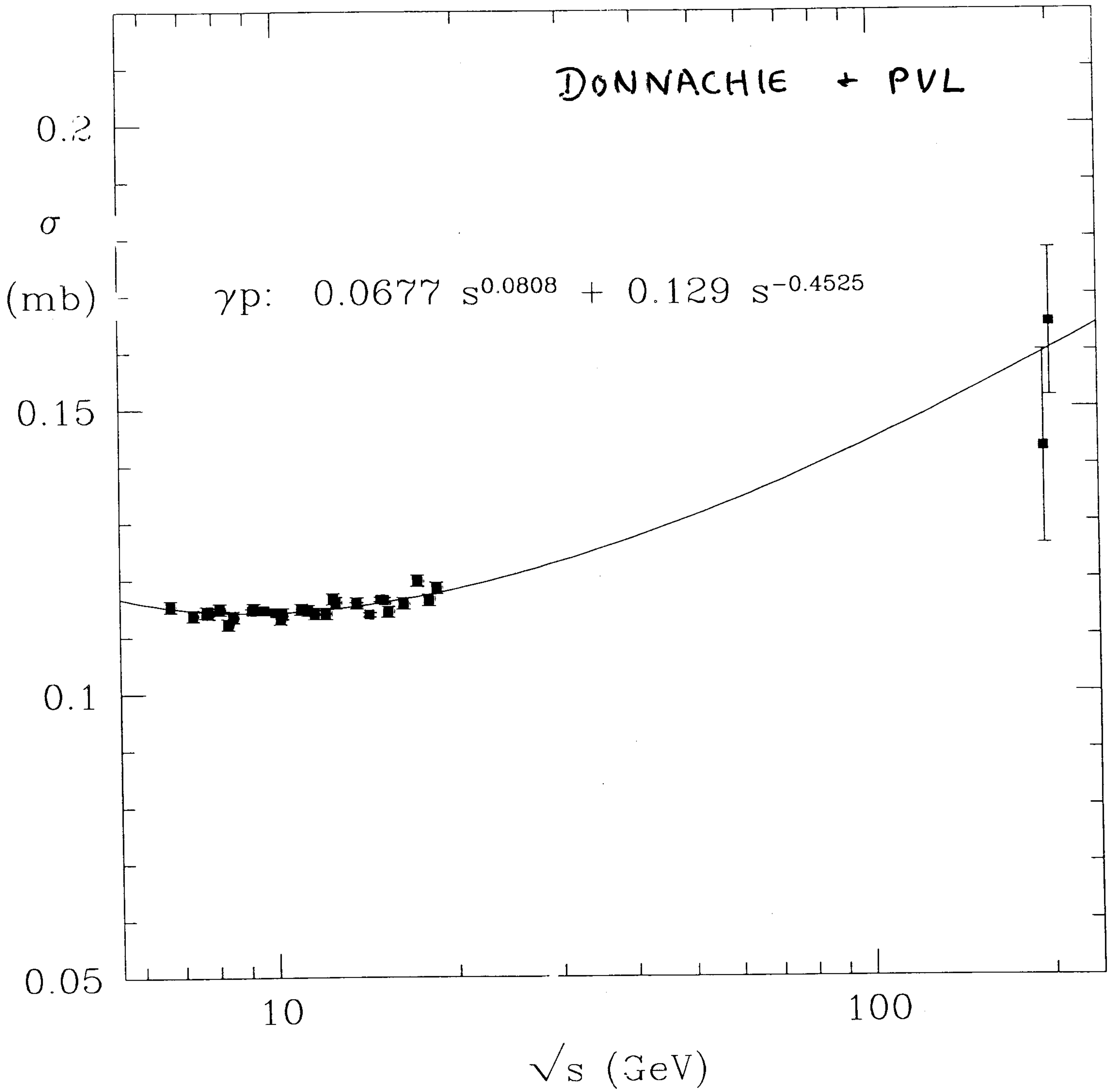


Fig. 1b). The slopes of the $\Delta\sigma$ straight lines are all equal to the Regge intercept of Fig. 1a). Data from ref. 6.



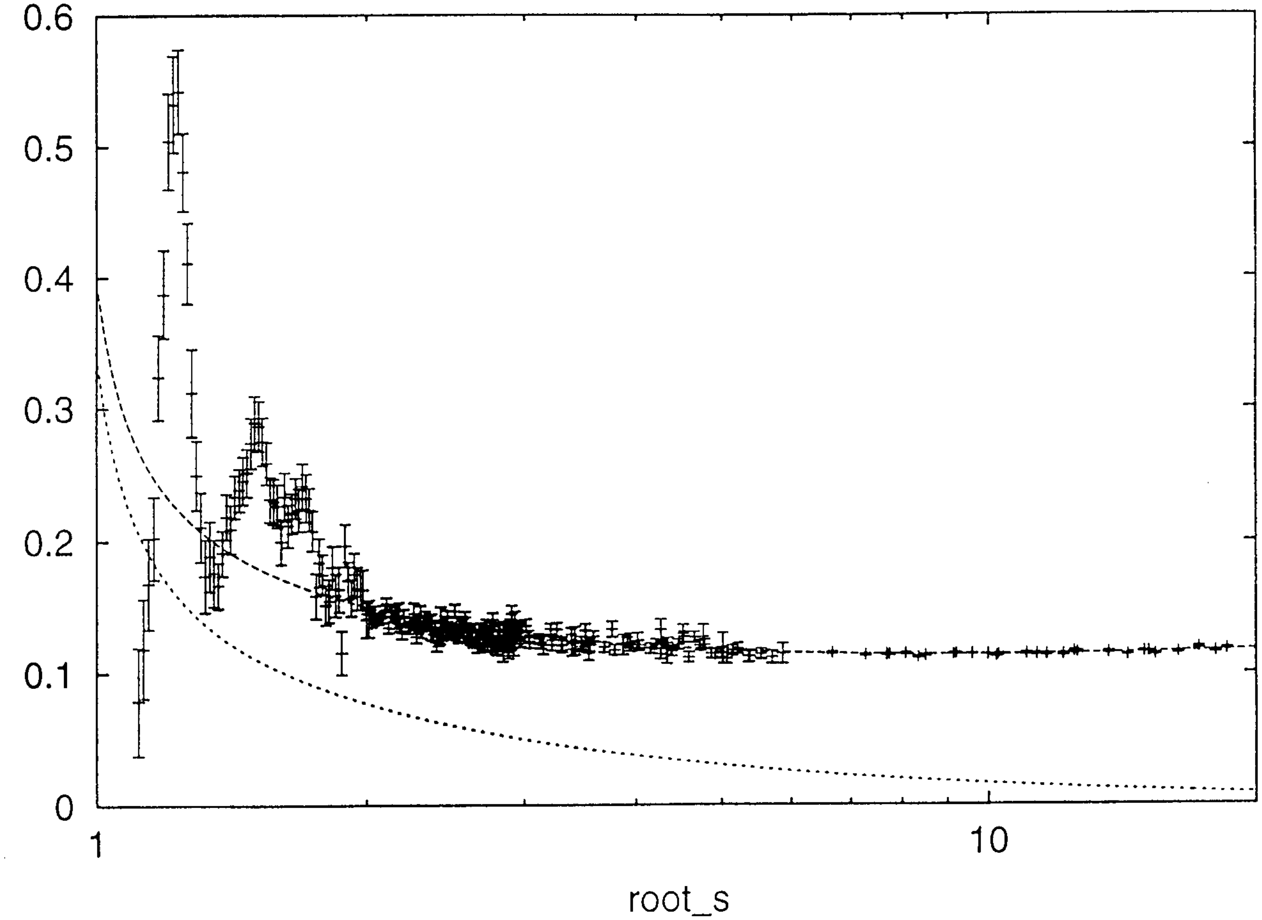
CDF
E710 →
E811
σ (mb)
POMERON
pBARp: 21.70s^0.0808+98.39s^-0.4525
pp: 21.70s^0.0808+56.08s^-0.4525
(DONNACHIE + PVL)
80
70
60
50
40
30
10
100
1000
√s (GeV)



$s^{-0.45}$ TERM : EXCHANGE OF FAMILIAR PARTICLES f, a

$s^{0.08}$ TERM : EXCHANGE OF SOFT POMERON

$$\sigma^{\gamma p} = \left. \frac{4\pi^2 \alpha_{EM} F_2}{Q^2} \right|_{Q^2=0}$$



BUT WHAT ABOUT pp?

BLOOM + GILMAN (1970)

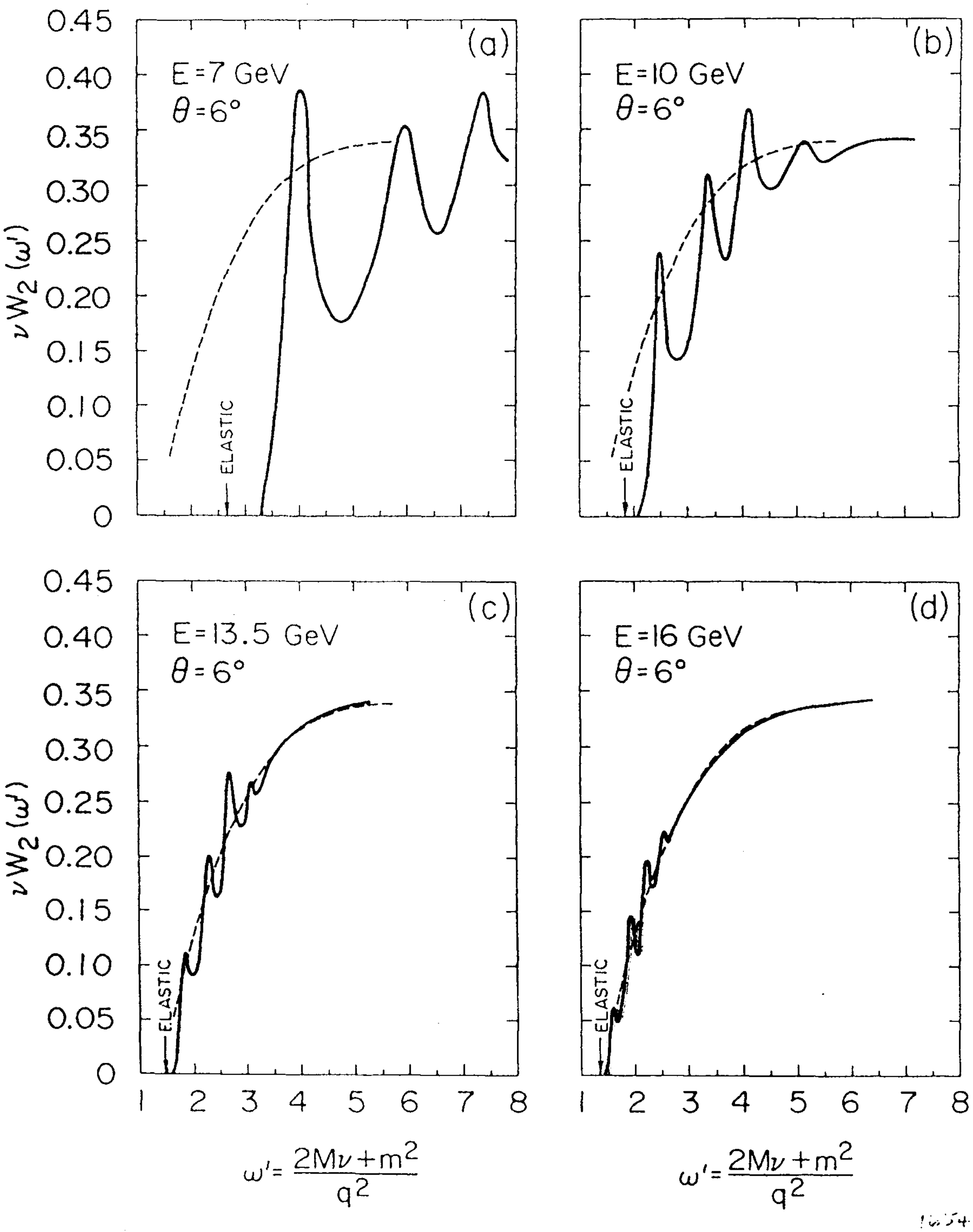


Figure 1 The function νW_2 plotted versus $\omega' = (2M\nu + m^2)/q^2$, with $m^2 = M_N^2$. The solid lines are smooth curves drawn through the $\theta = 6^{\circ}$ data at various incident electron energies. The dashed curve is the same in all cases and is a smooth curve through large ν and q^2 ($3 < q^2 < 7$ GeV^2) $W \geq 2$ GeV) $\theta = 10^{\circ}$ data. All data is plotted assuming $R = \sigma_S/\sigma_T = 0$ (see Ref. 1). Note that the E = 7 GeV, $\theta = 6^{\circ}$ data involves values

8.A.1

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$F_2(x) \sim x^{1-\alpha(0)}$

PARTONS AND DUALITY IN DEEP INELASTIC LEPTON SCATTERING

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Abstract: The parton approach, with the partons identified as quarks, is combined with a dual model to describe deep inelastic lepton scattering. The partons are introduced through a non-perturbative field-theory formalism, which is shown to reproduce many of the results of more phenomenological approaches. Duality is imposed by assuming that exotic states correspond to a purely diffractive contribution, and by constructing a Veneziano-like model for the non-diffractive contribution. It is found that the difference between the cross sections on proton and neutron is just less than one third of the experimental cross section for electroproduction on the proton. The proton cross section is well explained by assuming that the diffractive contribution is small.

VALENCE $F_2(x) \sim x^{1/2}$

SEA $x^{-\epsilon}$ $\epsilon \simeq 0.08$

AL REVIEW D VOLUME 4, NUMBER 11 1 DECEMBE]

Inelastic Lepton-Nucleon Scattering and Lepton Pair Production in the Relativistic Quark-Parton Model*

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(Received 26 July 1971)

We discuss the interaction of hadrons with leptons in the limit of large momentum transfer. A special parton model will be used for the hadrons in which the partons are identified with quarks. The relativistic quark model with which we interpret recent observations is formulated as follows: (1) The baryons are composed of three valence quarks and a core of an indefinite number of quark-antiquark pairs. (2) The lepton "sees" the nucleon in the limit of large momenta in the c.m. frame as an assembly of freely moving constituents with point charges. (3) The scattering of the valence quarks is interpreted as the nondiffractive component, the scattering of the core is interpreted as the diffractive component of the cross section. (4) The nondiffractive scattering is assumed to be mediated by suitable meson exchanges, and this assumption determines the momentum distribution of the valence quarks.