Diffraction and Low-x 2018

26 August 2018 to 1 September 2018
Reggio Calabria, Italy

Odderon and LHC data

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* New "open" of max-Odderon
* Elastic hadron scattering – new data LHC
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* Overlapping function at $\sqrt{s} = 13\ TeV$;
* Total cross sections
* Results and Summery

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Did TOTEM experiment discover the Odderon?

Evgenij Martynov [a,*], Basarab Nicolescu [b]

At $s \to \infty$ we have

$$\Delta\sigma(s) \equiv \sigma_{tot}^{\bar{p}p}(s) - \sigma_{tot}^{pp}(s) \to 2O_1\pi \ln(s/m^2) \quad (16)$$

$$\Delta\rho(s) \equiv \rho^{\bar{p}p}(s) - \rho^{pp}(s) \to -2\frac{O_1}{H_1} \quad (17)$$

E.Leader, P. Gauron, B. Nicolescu, Nucl.Phys.B (1988)

Table 1
The values of parameters of FMO model.

Parameter	Value	Error
H_1 (mb)	0.24964	$^{+0.02452}_{-0.03058}$
H_2 (mb)	−0.31854	$^{+0.86147}_{-0.63729}$
H_3 (mb)	30.012	$^{+4.304}_{-6.363}$
O_1 (mb)	−0.05098	$^{+0.01050}_{-0.00989}$

$$\rho(s,t) = \mathrm{Re}F_h(s,t) / \mathrm{Im}\,F_h(s,t);$$

$$\Delta\rho = -2(-0.05098/0.24964) = 0.408; \quad hence \quad \rho_{p\bar{p}} = 0.5;$$

We would like to stress that there is no general argument against the FMO approach.

Volume 232, number 2 PHYSICS LETTERS B

30 November 1989

FORWARD SCATTERING AT COLLIDER ENERGIES AND EIKONAL UNITARIZATION OF THE ODDERON ☆

J. FINKELSTEIN [1]
Department of Physics, San Jose State University, San Jose, CA 95192, USA

H.M. FRIED, K. KANG and C-I TAN
Department of Physics, Brown University, Providence, RI 02912, USA

(8) behaves as $s^{-\delta}$, and so $\Delta\sigma_T(s) \to O(s^{-\delta}\log s)$.

(ii) *Bare odderon coincides with bare pomeron trajectory.* In this case, $\delta = 0$, $r \to \alpha'_- / \alpha'_+ = 1$, and the first integral in (8) goes to a real constant. Since $\mathrm{Re}\,B_- \sim \log s$, $\mathrm{Im}\,B_- = -2\pi\alpha'_-$, we find that $\mathrm{Re}\,F_- \sim s\log s$ and $\mathrm{Im}\,F_- \sim s$, as claimed earlier by an analyticity argument.

Problems

$$CERN \quad \bar{p}p \to \bar{p}p \quad \sqrt{s} = 540\ GeV$$

$\rho = 0.24 \pm 0.04$ (*UA4 Coll. M. Bozzo et al.*)

$\rho = 0.135 \pm 0.015$ (*UA4/2 Coll., C.Augier et al.*)

<u>*Comment*</u>

1992 $\rho = \not{0.24} \to 0.19 \pm 0.03$ (*O.V. Selyugin, Yad.Fiz.* 55, 841)

1995 $\rho = \not{0.135} \to 0.17 \pm 0.02$ (*O.V. Selyugin, Phys. Lett. B* 198, 583)

2009 $\rho = 0.172 \pm 0.009$

(*A.Kendi, E.Ferreira, T.Kodama, arXiv*: 0905.1955(*hep – ph*))

ODDERON s and t dependence

Max Odderon - $\mathrm{Re}(O_-) \propto \ln(s/s_0)^2; \ \mathrm{Im}(O_-) \propto \ln(s/s_0);$

A. Donnachie, P.V. Landshoff

$$\frac{-\lambda \hat{t}}{\hat{t}+\tau} \ \ at \ -\hat{t} < t_1;$$

$$g(t) = C\frac{t_0^3}{t^4} \ \ at \ |t| > t_0; \ \ C = 0.04; \ t_0 = 4.23\ GeV^2;$$

$$g(t) = C\frac{1}{t_0}e^{2(1-t^2/t_0^2)} \ \ at \ |t| < t_0;$$

E. Martynov, arXiv: 1305.3093
(E.Leader, P. Gauron, B. Nicolescu,
Phys.Lett.B (1990)

$$\mathrm{O}(s,t) = z\ t\ [O_1(s,t) + O_2(s,t) + O_3(s,t)]$$

O.V.S. HEGS model

$$\mathrm{O}(s,t) = \frac{h_t\ t}{1+r_o^2\ t}\ e^{Bt/4\ Ln(s/s_0)}\ ;$$

Simple phenomenological analysis of 13 TeV data

$$F_1^{em}(t) = \alpha f_1^2(t)\frac{s-2m^2}{t}; \quad F_3^{em}(t) = F_1^{em};$$

and for spin-flip amplitudes:

$$F_2^{em}(t) = \alpha\frac{f_2^2(t)}{4m^2}s; \quad F_4^{em}(t) = -F_2^{em}(t),$$

$$F_5^{em}(t) = \alpha\frac{s}{2m\sqrt{|t|}}f_1(t)\ f_2(t),$$

where the form factors are:

$$f_1(t) = \frac{4m_p^2 - (1+k)\ t}{4m_p^2 - t}G_d(t);$$

$$f_2(t) = \frac{4m_p^2\ k}{4m_p^2 - t}\ G_d(t);$$

$$\frac{dN}{dt} = \mathcal{L}\left[\frac{4\pi\alpha^2}{|t|^2}G^4(t) - \frac{2\alpha\left(\rho(s,t)+\phi_{CN}(s,t)\right)\sigma_{tot}G^2(t)e^{-\frac{B(s,t)|t|}{2}}}{|t|} + \frac{\sigma_{tot}^2(1+\rho(s,t)^2)e^{-B(s,t)|t|}}{16\pi}\right] \quad ($$

Non-exponential behavior (origins)

1. Non-linear Regge trajectory

   a) Contributions of the meson cloud (J.Pumplin, G.L. Kane; O.V.S.)

   b) Pion loops (Anselm, Gribov, Khoze, Martin; Jenkovski et al.)

2. Different slopes of the other contributions
   (real part, odderon, spin-flip amplitude)

3. Unitarization

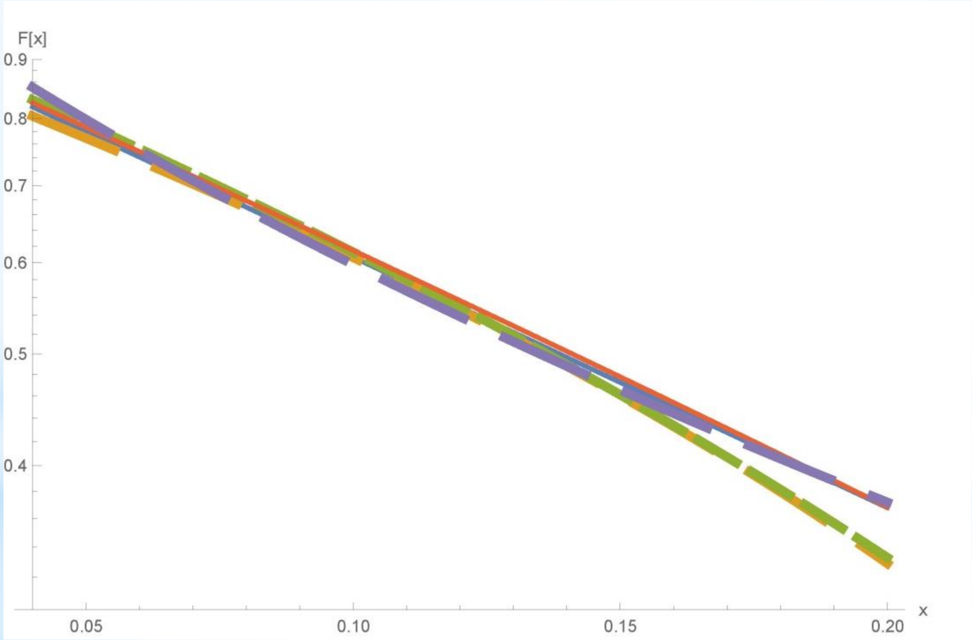
$$\Gamma(b) = e^{-b^2/R^2}; \quad \to \quad F_1(t) \approx e^{5t};$$

$$\Gamma(b) = \delta(R_0); \quad \to \quad F_1(t) \approx J_0(R\sqrt{|t|});$$

$$\Gamma(b) = e^{-(b-R_0)^{\wedge}2/R_0^2}; \to \quad F_1(t) \approx e^{2.8t} J_0(2.8\sqrt{|t|});$$

$$\Gamma(b) = C(0 - R_0); \quad \to \quad F_1(t) \approx J_1(R_0\sqrt{|t|}) / R_0\sqrt{|t|};$$

$$\Gamma(b) = e^{-\mu(\sqrt{4R_o^2 - t})}; \quad \to \quad F_1(t) \approx e^{-5R_0(\sqrt{\mu^2 - t} - \mu)};$$



Phenomenologic analysis (exponentials)

$$F^h(s,t)=(i+\rho)\frac{\sigma_{tot}}{4\pi\,0.38938}e^{Bt/2}$$

$$F^h(s,t)=(i+\rho)\frac{\sigma_{tot}}{4\pi\,0.38938}e^{Bt/2-Ct^2}$$

$$F^h(s,t)=(i+\rho)\frac{\sigma_{tot}}{4\pi\,0.38938}e^{Bt/2+D(\sqrt{4\mu^2-t}-2\mu)]}$$

$$F^h(s,t)=[i+\rho(t)]\frac{\sigma_{tot}}{4\pi\,0.38938}e^{Bt/2+D(\sqrt{4\mu^2-t}-2\mu)]+Ct^2} \quad f(t)^2_{em.};$$

$$F^h(s,t)=h\frac{\sigma_{tot}}{4\pi\,0.38938}e^{Bt/2+i\varphi(t)}$$

TOTEM analysis 13 TeV

$$0.0085 \le |t| \le 0.07 \;\; GeV^2; \quad N = 80 .$$

Table 5: Summary of results for various fit config

	$\|t\|_{max} = 0.07\,\mathrm{GeV}^2$	
N_b	χ^2/ndf	ρ
1	0.7	0.09 ± 0.01
2	0.6	0.10 ± 0.01
3	0.6	0.09 ± 0.01

1. Normalization on $\sigma_{el} = 31.0 \pm 1.7 \;\, mb\,(5.5\%).$

$$\sigma_{tot} = 110.6 \pm 3.4 \;\, mb\,(3.1\%).$$

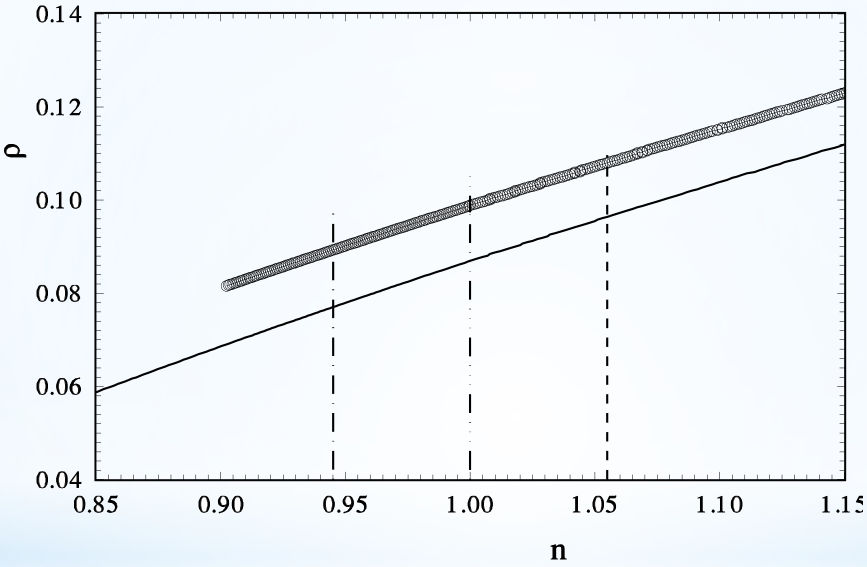
2. “unprecedented precision” $\rho = 0.1 \pm 0.01 \; mb\,(10\%).$

UA4/2 – (in text) $\rho = 0.135 \pm 0.007 \;\, mb\,(5.\%).$

3. $CNI \;\; term \;\; from \quad A_N\,(1 - i\alpha G(t));$

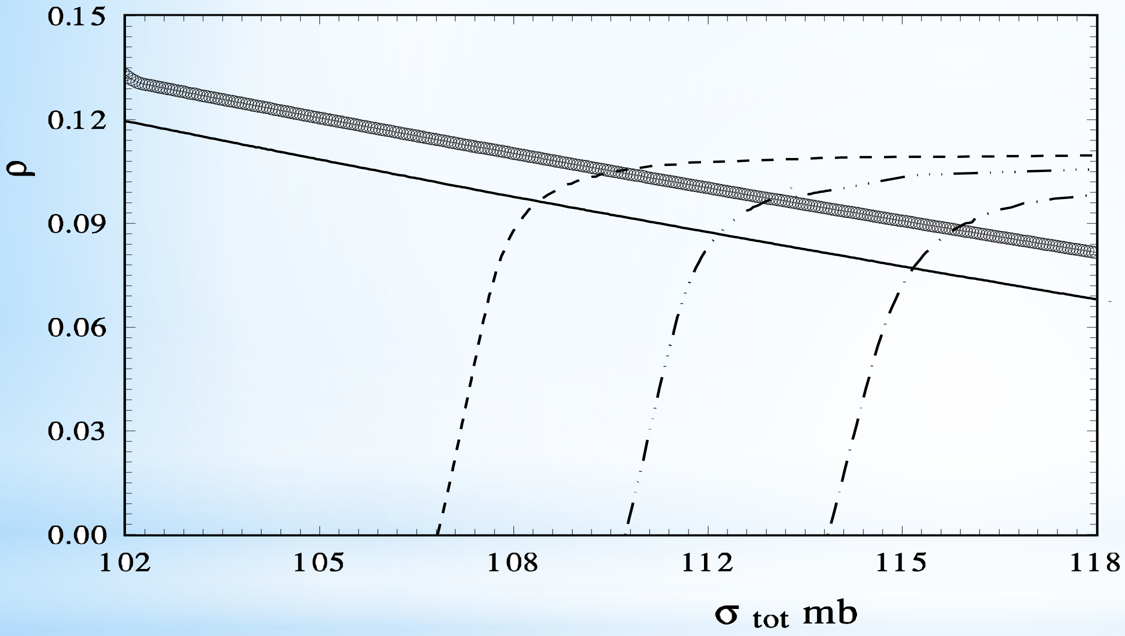
TOTEM 13 TeV

$$0.00085 \leq |t| \leq 0.07 \;\; GeV^2; \quad N = 80.$$



Simple exponential (Born term)

$$F_B^h(s,t) = h[i - \rho_0(1 + at)]\ f_1(t)^2\ \sigma_{tot}\ e^{\alpha' t}$$



With form-factor

n- free

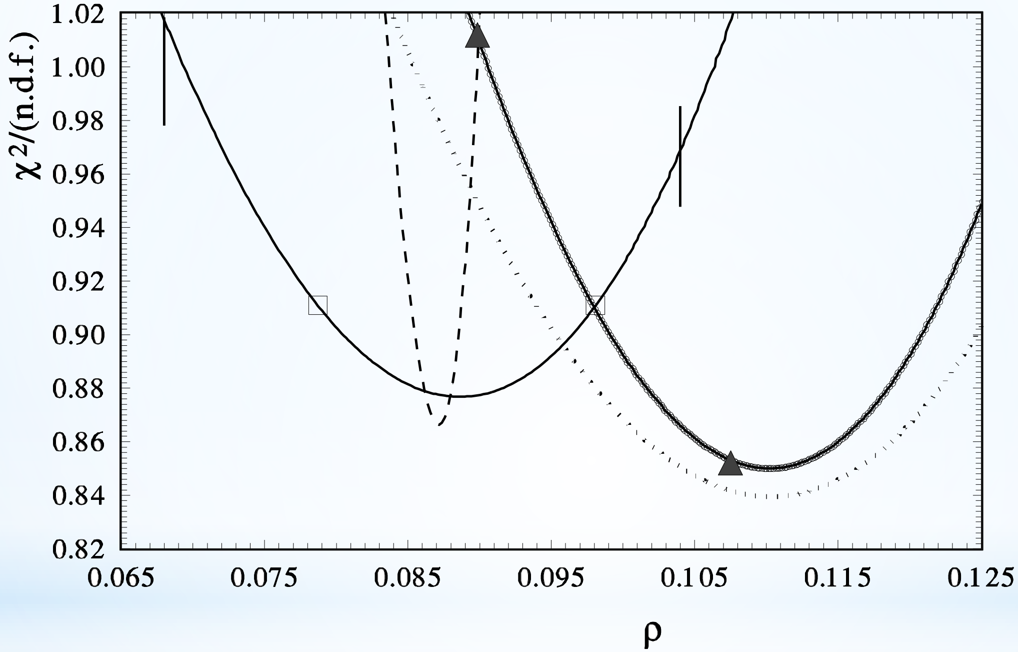
Without form-factor

n(fix) = 1.055; 1.0; 0.945

totrho

Eikonal representation

$$F_B^h(s,t) = h\,\hat{s}^{\Delta}\; f_1(t)^2\,\sigma_{tot}\, e^{\alpha' t\, Ln(\hat{s})}$$



$$\rho_{Born}(\sqrt{s} = 13 TeV, t = 0) = 0.089 \pm 0.013;$$

$$\rho_{Unitar.}(\sqrt{s} = 13 TeV, t = 0) = 0.11 \pm 0.016;$$

Rhochi2-eik

TOTEM 13 TeV

(extraction ReF(s,t) from experimental data)

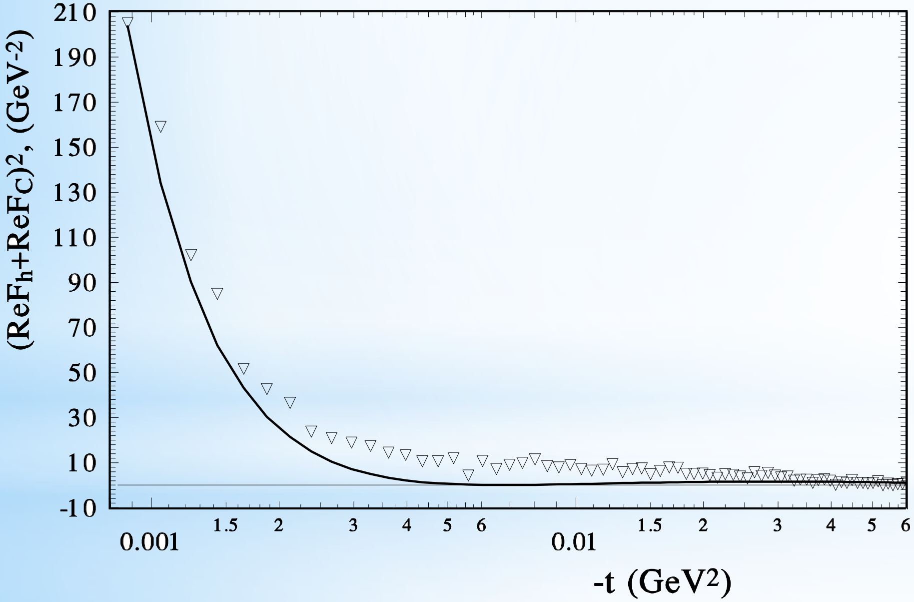
O.S. "VI Intern. Conf. On Diffraction...", Blois, France,(1995);
O.S., P. Gauron, B. Nicolescu, Phys.Lett. B629 (2005) 83-92;

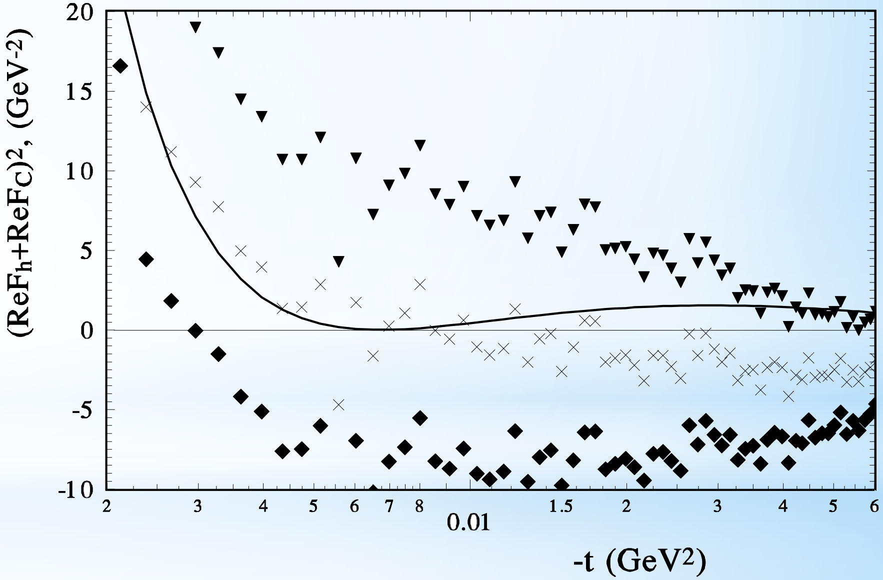
$$\Delta_R^{th}(t) = [\mathrm{Re}\, F^h(t) + \mathrm{Re}\, F^C(t)]^2; \qquad \sigma_{tot}\ mb,\ B(t),\ \rho(t=0),\quad n;$$

$$\Delta_R^{Exp}(t) = [\frac{d\sigma}{dt}|_{\mathrm{exp.}} - k\pi\,(\mathrm{Im}\, F^h(t) + \mathrm{Im}\, F^C(t)]^2 / (k\pi)$$

$$F_h(s,t) = h\,(1+\rho)\,\sigma_{tot}\,e^{Bt/2};$$

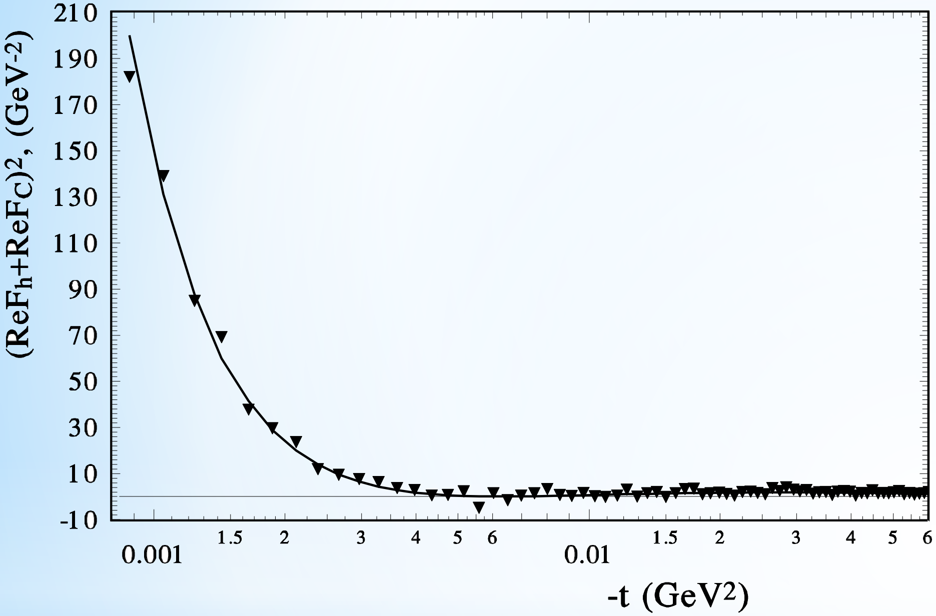
$$\sigma_{tot} = 110.6\ mb,\ \ B = 20.36\ GeV^{-2},\ \rho(t=0) = 0.1,\ n = 1.;$$

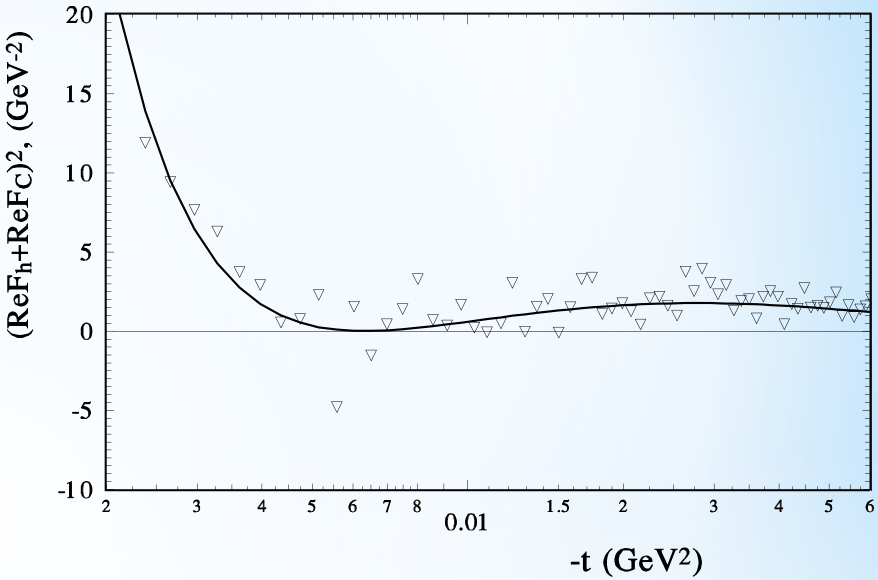




$$F_B^h(s,t) = h\ (i+\rho)\ \sigma_{tot}\, e^{\alpha' t}\ f_1(t)^2;$$

$$\sigma_{tot} = 108\ mb,\ \ \rho(t=0) = 0.108,\ n = 1.06;$$





$$t_0 = -0.0063\ GeV^2;\ \ F_C(t_0) = -2.25;\ \ \mathrm{Re}\,F_h = 2.25;\ \ \rho(t_0) = 0.105;$$

Odderon and HEGS model

High Energy General Structure (HEGS) model O.V.S. - Eur. Phys. J. C (2012) 72:2073

Extending of model (HEGS1) – O.V. S. Phys.Rev. D 91, (2015) 113003

$$\hat{s} = s / s_0\, e^{-i\pi/2}; \qquad s_0 = 4m_p^2.$$

$$n = 980 \rightarrow 3416; \quad 9 \leq \sqrt{s} \leq 8000\, GeV; \; 0.00037 < |t| < 15\ GeV^2;$$

$$F_1^B(s,t) = h_1 G_{em}(t)\ (\hat{s})^{\Delta_1} e^{\alpha_1 t \ln(\hat{s})}; \qquad F_2^B(s,t) = h_2 G_A(t)^2\ (\hat{s})^{\Delta_1} e^{\alpha_1/4 t \ln(\hat{s})}$$

$$F^B(\hat{s},t) = F_1^B(\hat{s},t)(1 + R_1/\sqrt{\hat{s}}\ )] + F_2^B(\hat{s},t)(1 + R_2/\sqrt{\hat{s}}\ )] + F_{odd}^B(s,t);$$

$$F_{Odd}^B(s,t) = h_{Odd}\ G_A(t)^2\ (\hat{s})^{\Delta_1}\ \frac{t}{1 - r_o^2 t} e^{\alpha_1/4 t \ln(\hat{s})};$$

$$B(t) = (\alpha_1 + k_0\, q\, e^{k_0\, t\, ln\hat{s}}\ )\ln \hat{s}.$$

5+4 – fitting parameters

General Parton Distributions -GPDs

Electromagnetic form factors (charge distribution)

Gravitation form factors (matter distribution)

$$F_1^D(t) = \frac{4M_p^2 - t\,\mu_p}{4M_p^2 - t} G_D(t);$$

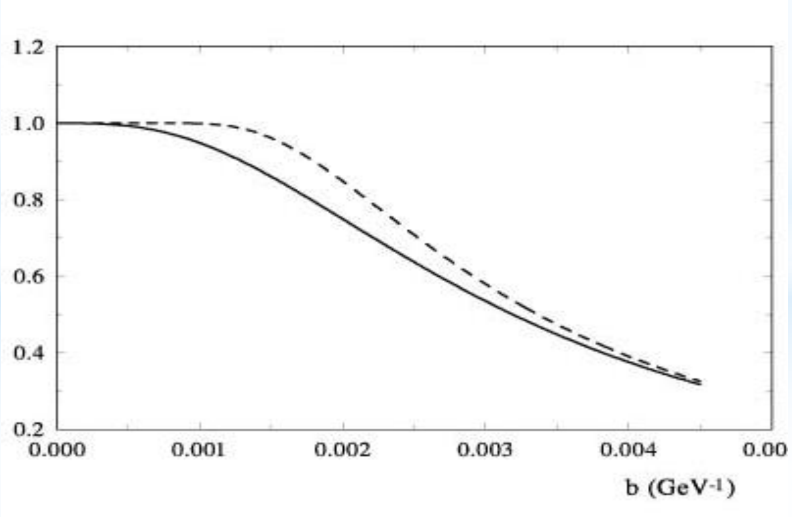
$$G_D(t) = \frac{\Lambda^4}{(\Lambda^2 - t)^2};$$

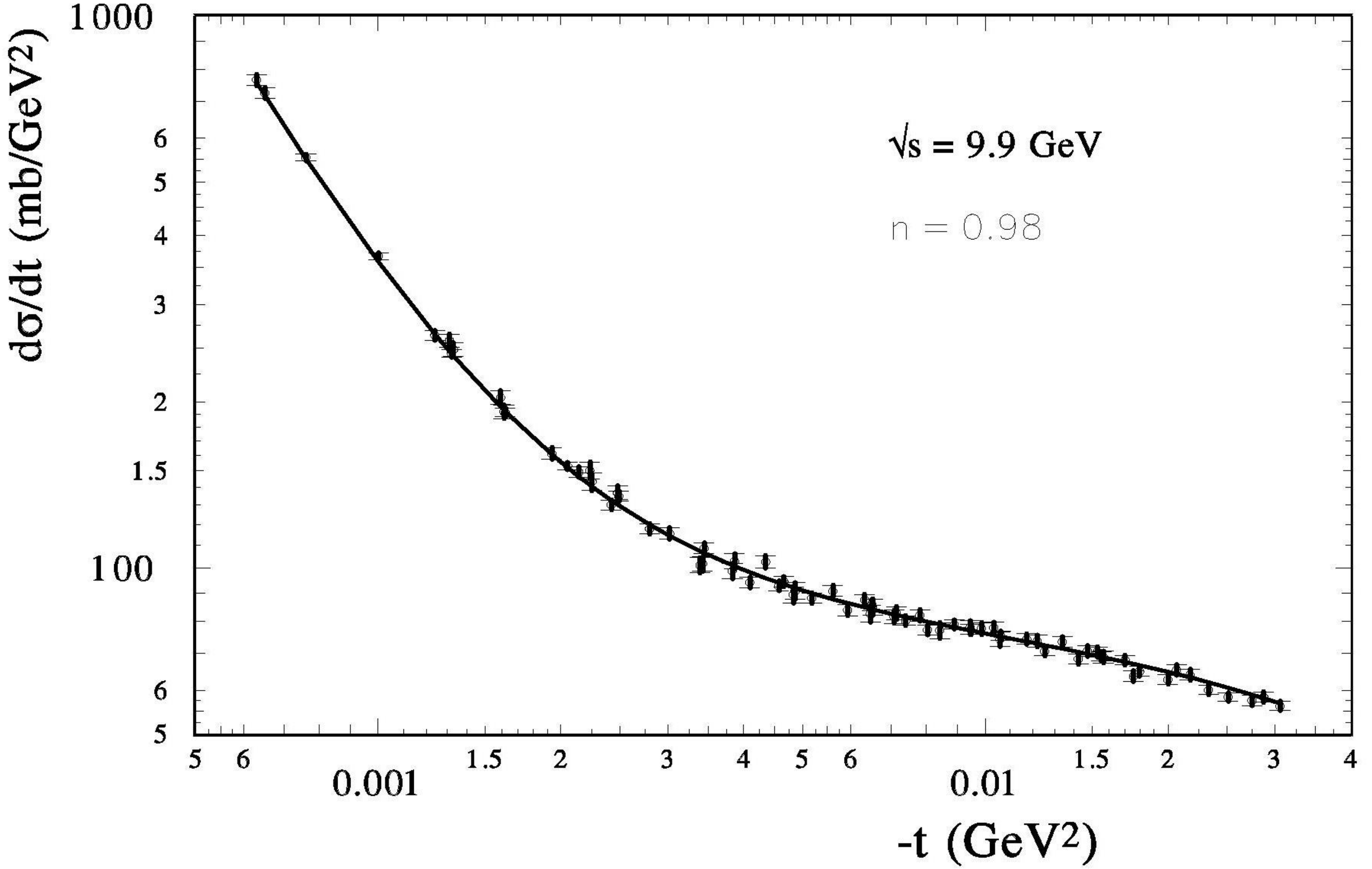
$$G_A(t) = \frac{\Lambda_A^4}{(\Lambda_A^2 - t)^2};$$

UNITARIZATION → eikonal representation

$$\chi(s,b) = 2\pi \int_0^\infty q\ J_0(bq)\ F_B^h(s,q)\,dq \qquad \chi(s,b) = -\frac{1}{2k}\int_{-\infty}^{\infty} dz V[\sqrt{z^2+b^2}\,]$$

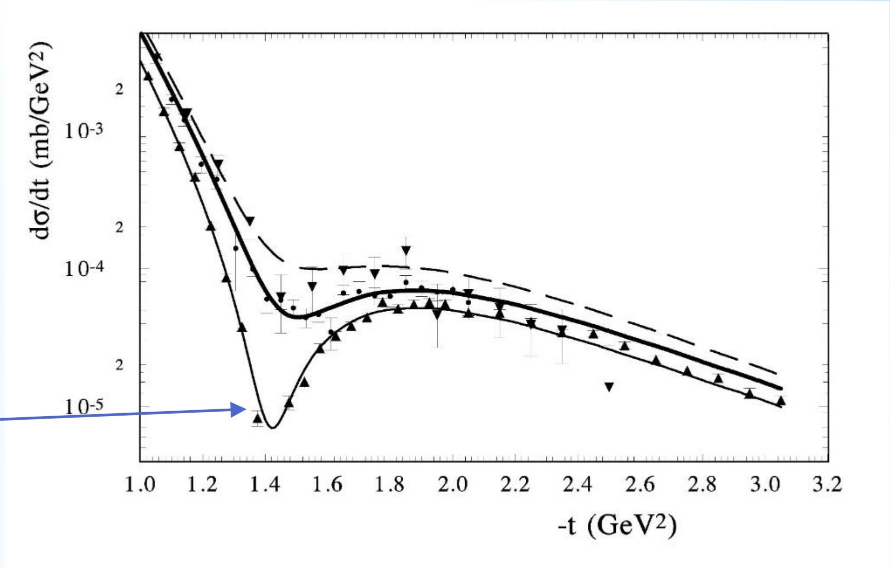
$$F^h(s,t) = \frac{1}{2\pi}\int_0^\infty b\ J_0(bq)\ [1-e^{-\chi(s,b)}]\,db$$



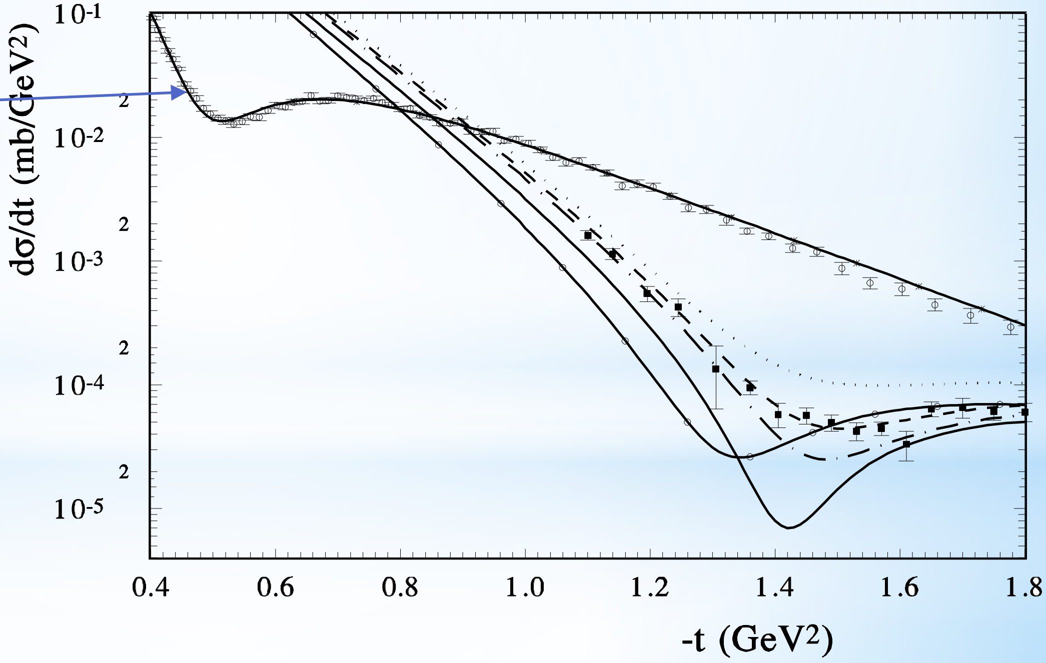


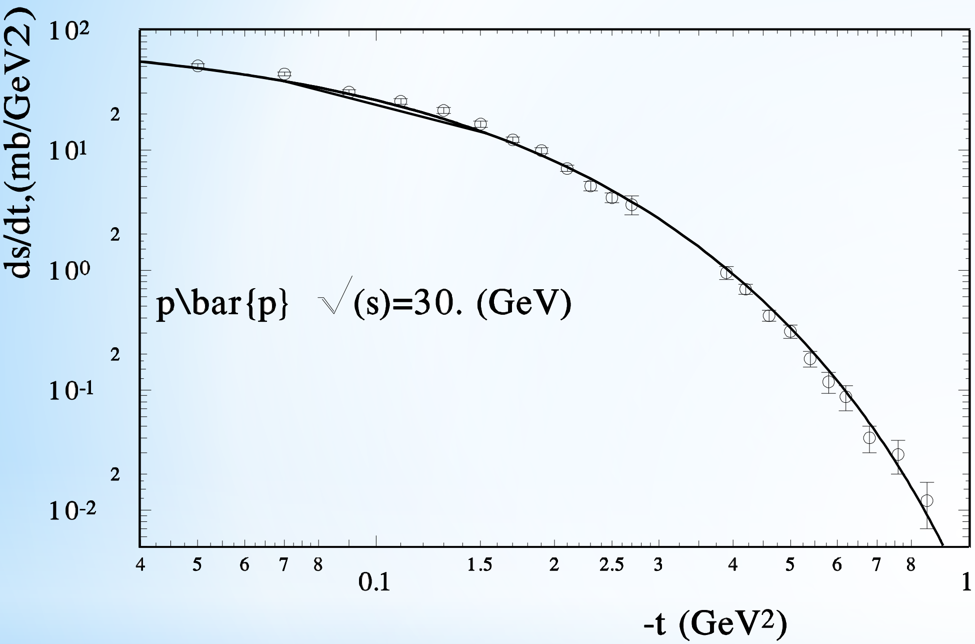
dσ/dt (mb/GeV2)
1000
6
5
4
3
2
1.5
100
6
5
√s = 9.9 GeV
n = 0.98
5
6
0.001
1.5
2
3
4
5
6
0.01
1.5
2
3
4
-t (GeV2)

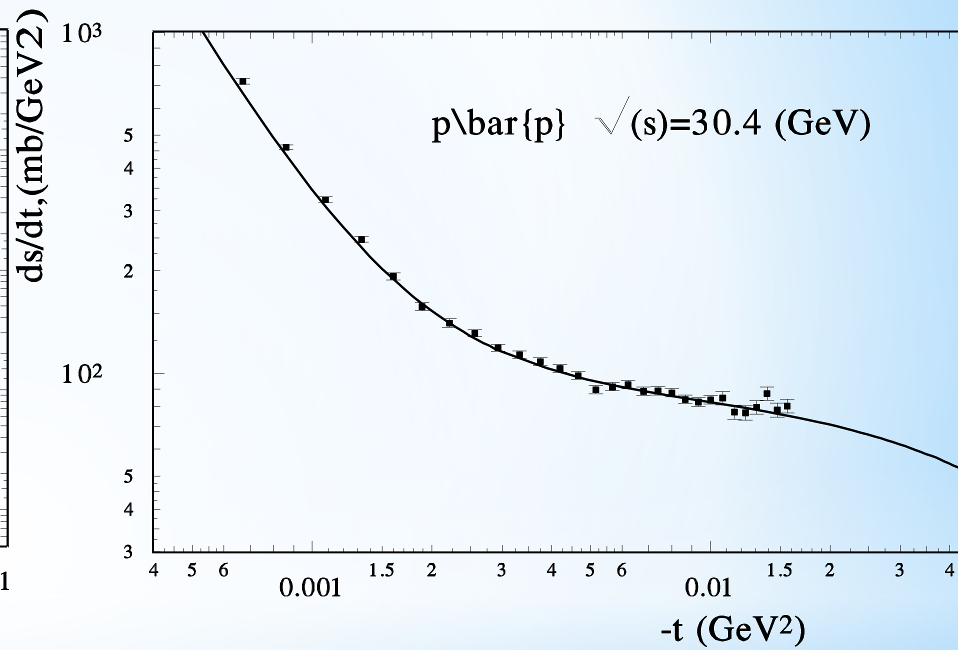
$\sqrt{s} = 30\,GeV;$



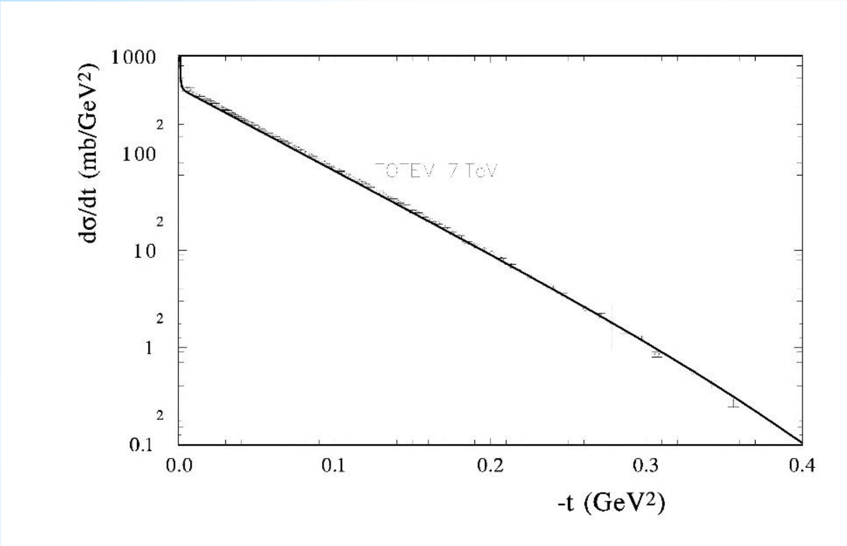
$\sqrt{s} = 7\,TeV;$



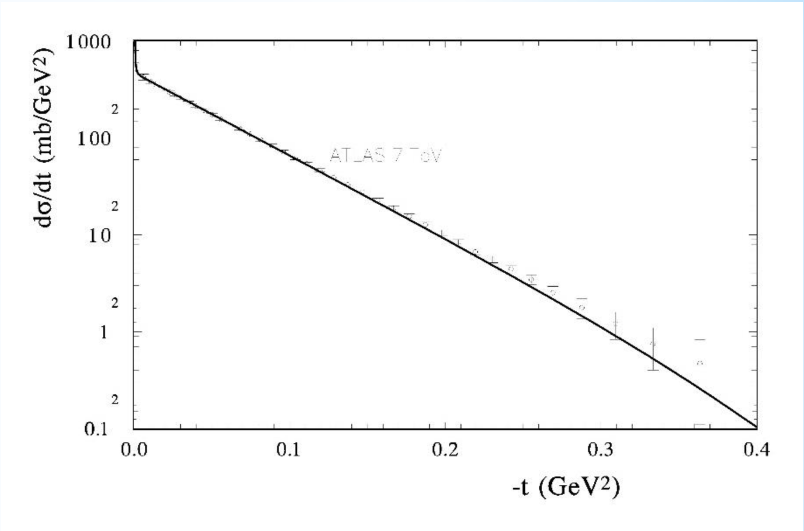

ds/dt,(mb/GeV2)
10^2
10^1
10^0
10^{-1}
10^{-2}
p\bar{p}   √(s)=30. (GeV)
0.1
1
-t (GeV2)


ds/dt,(mb/GeV2)
10^3
10^2
p\bar{p}   √(s)=30.4 (GeV)
0.001
0.01
-t (GeV2)

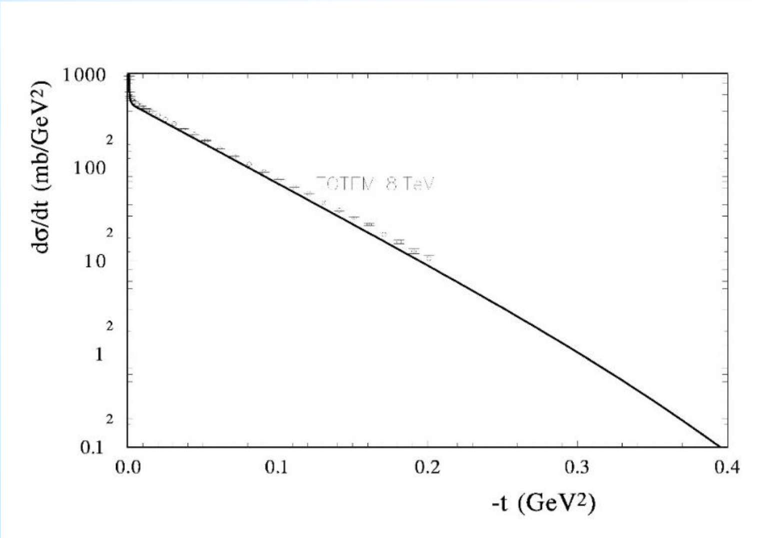
7 TeV (TOTEM) - t [0.00515 – 0.371]
n = 0.94



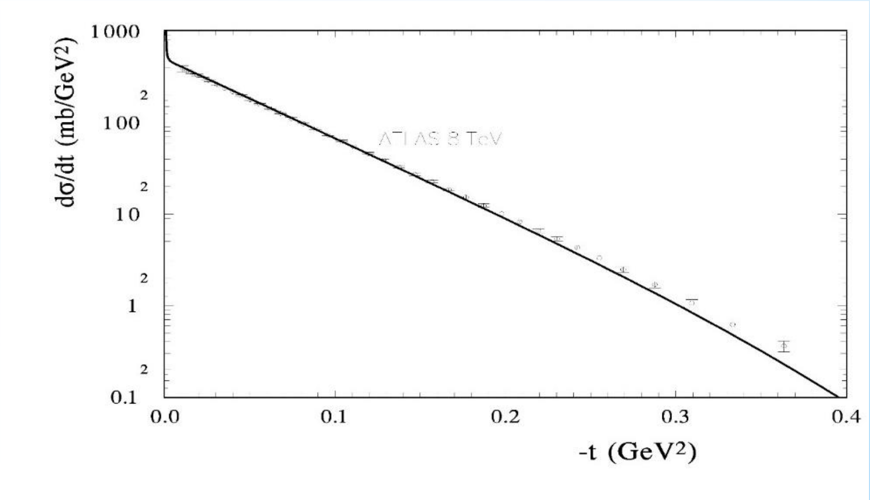
7 TeV (ATLAS) - t [0.0062 – 0.3636]
n=1.0



8 TeV (TOTEM) - t [0.000741 – 0.201]
n=0.9



8 TeV (ATLAS) - t [0.01050 – 0.3635]
n=1.0



HEGS-h model and Odderon

$$n \to 870; \quad 100 \leq \sqrt{s} \leq 13000\, GeV; \; 0.0008 < |t| < 3\, GeV^2;$$

$$F_{Odd}^{B}(s,t) = G_A(t)^2 \; (\hat{s})^{\Delta_1} \; (h^c{}_{Odd} + h^t{}_{Odd} \frac{t}{1 - r_o^2 t}) \; e^{B(t)/4t \ln(\hat{s})};$$

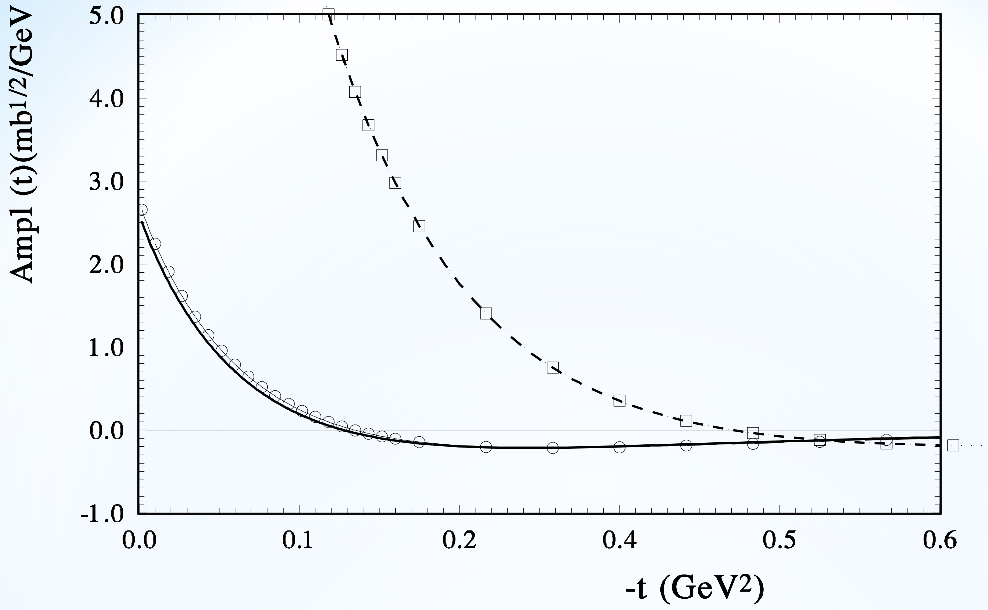
$$B(t) = \alpha_1 [1 + q\, e^{\alpha_0 t \ln\hat{s}} \; / \, (1 + \alpha_0 \; \ln\hat{s}\,)].$$

Without Oddron – 2 fitting parameters – pomerons constants: $h_1; \; h_2;$

$$\sum \chi^2 = 1207;$$

With Oddron – 5 fitting parameters (+ 3) : $+ \; h_{Odd}^{c}; \; h_{Odd}^{t}; \; r_0^2;$

$$(5) \to \sum \chi^2 = 1132;$$



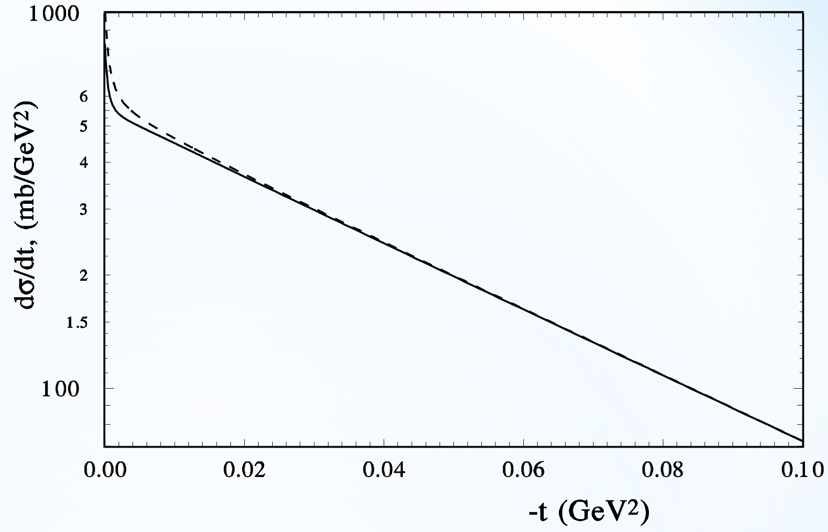
$$R = \frac{h^{c}_{Odd}}{h^{t}_{Odd}} = 0.2;$$

$The\,amplitude\,of\ \ pp\ \ at\ \sqrt{s} = 13TeV$

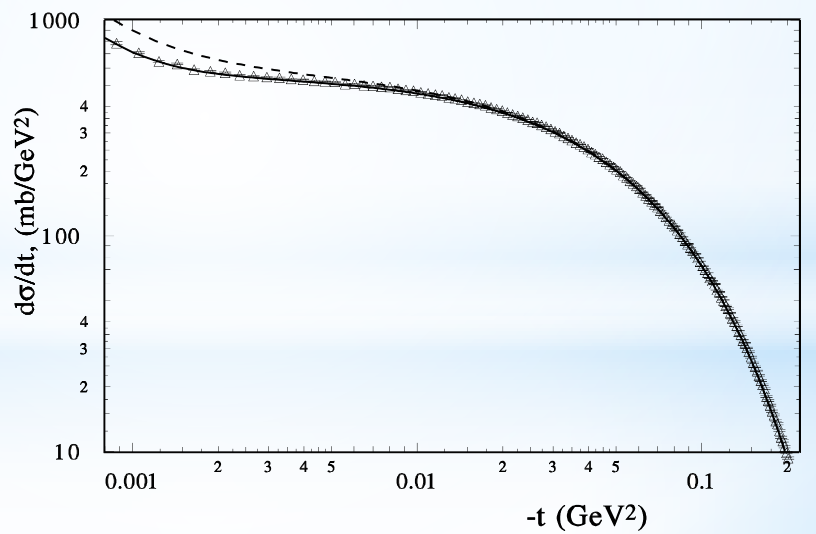
$with\ \ h^{t}_{Odd}\ \ \ dashed\ \ line - \mathrm{Im}\,F(t);\ hard\,line\ \mathrm{Re}\,F(t);$

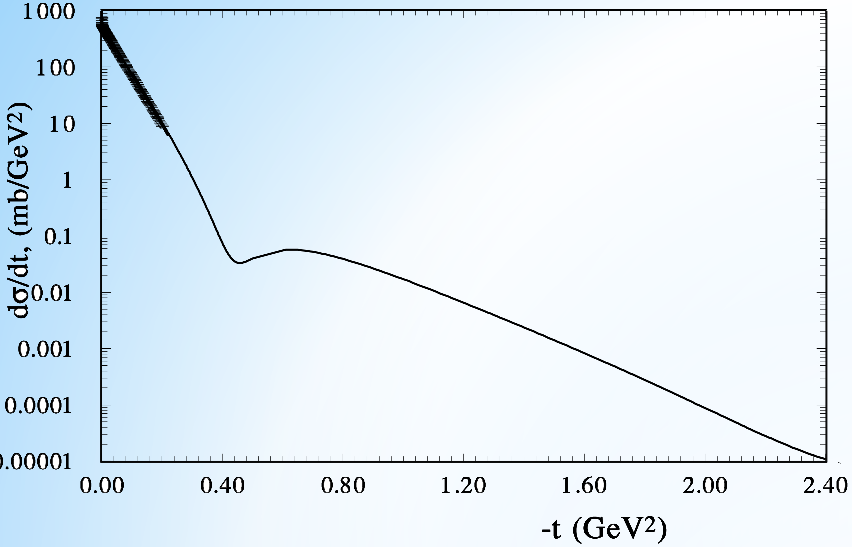
$with\ \ h^{C}_{Odd}\ and\ h^{t}_{Odd}\ \ (\square - \mathrm{Im}\,F(t);\ \ \mathrm{O} - \mathrm{Re}\,F(t));$

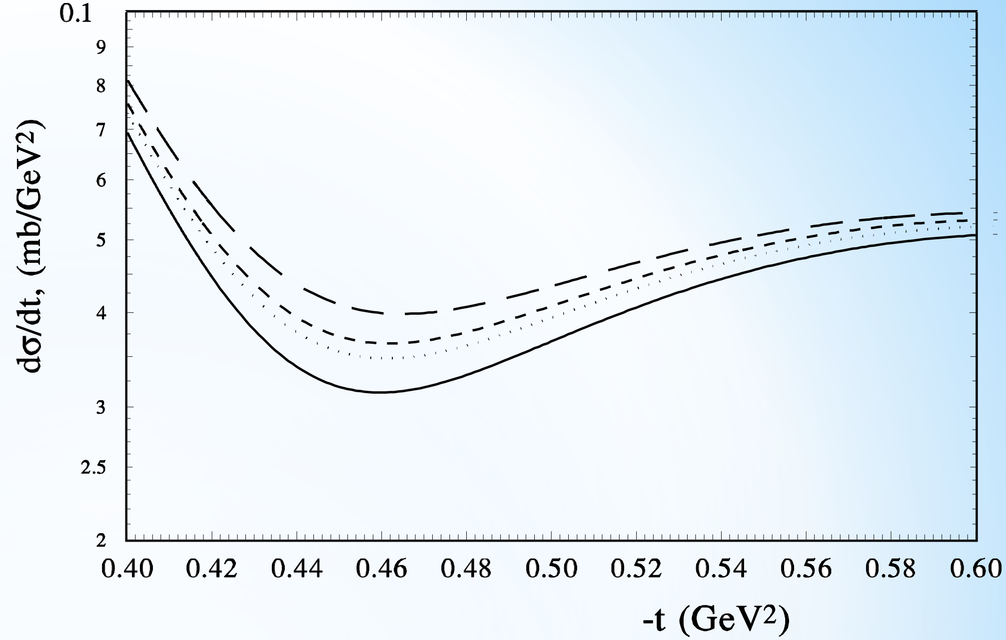
dashed line – $p\bar{p}$



$\Delta -$ *TOTEM data* $(\sqrt{s} = 13 TeV)$







hard line pp; *long dushed* $p\bar{p}$ (*HEGSh*);

dotted – pp; *short – dashed* – $p\bar{p}$ (*without Odderon*);

$$HEGSh \rightarrow -t_{\min} = 0.46\,GeV^2;\ -t_{\max} = 0.62\,GeV^2;\ R = 1.78;$$

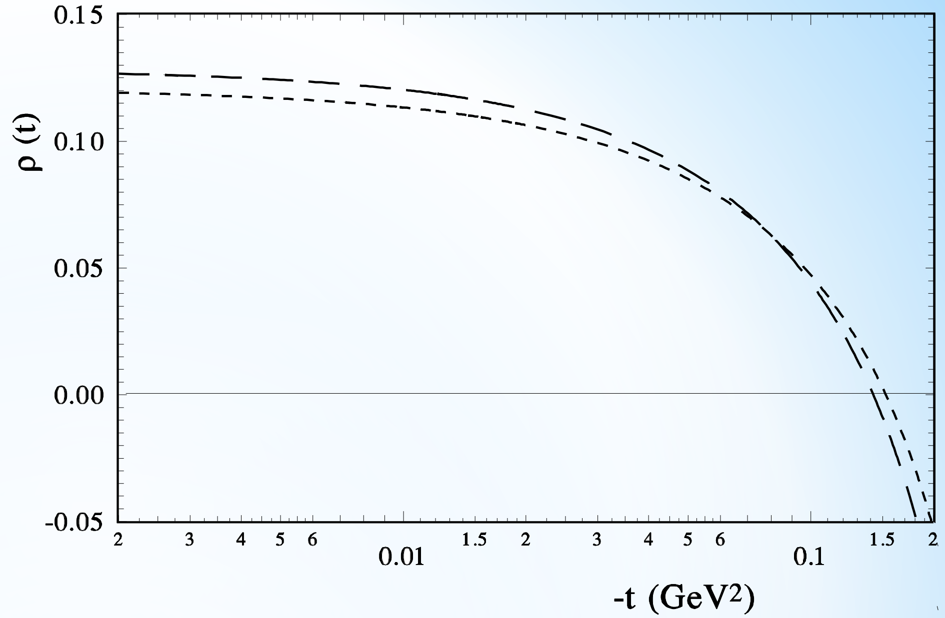
$$TOTEM \rightarrow -t_{\min} = 0.47\,GeV^2;\ -t_{\max} = 0.638\,GeV^2;\ R = 1.78;$$

Nemez, talk on workshop , May 28 (2018)

$\rho(t)$ *at* $\sqrt{s} = 13 TeV$;

long dashed line – pp;

short dashed line – $p\bar{p}$;

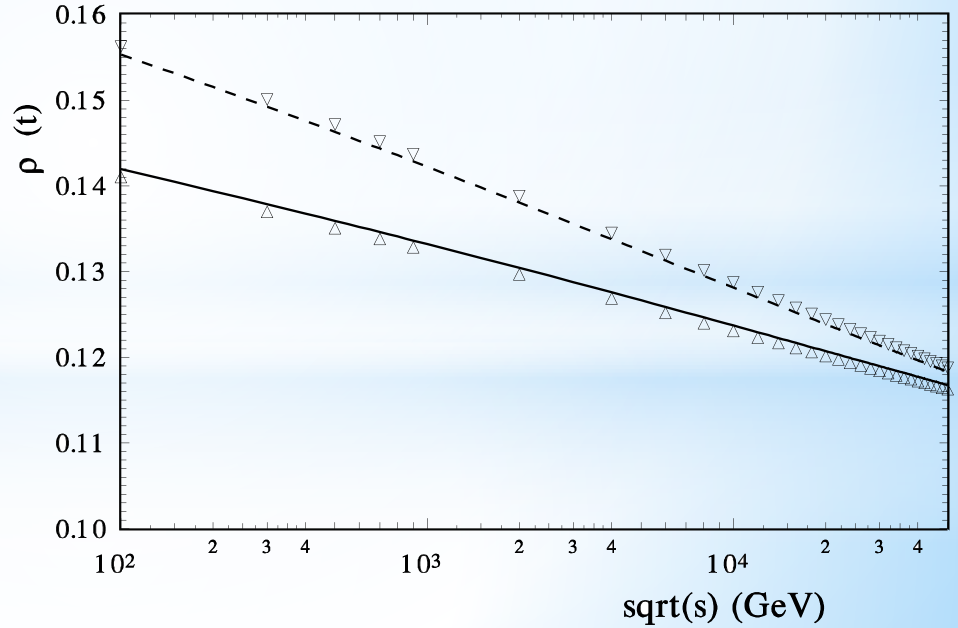


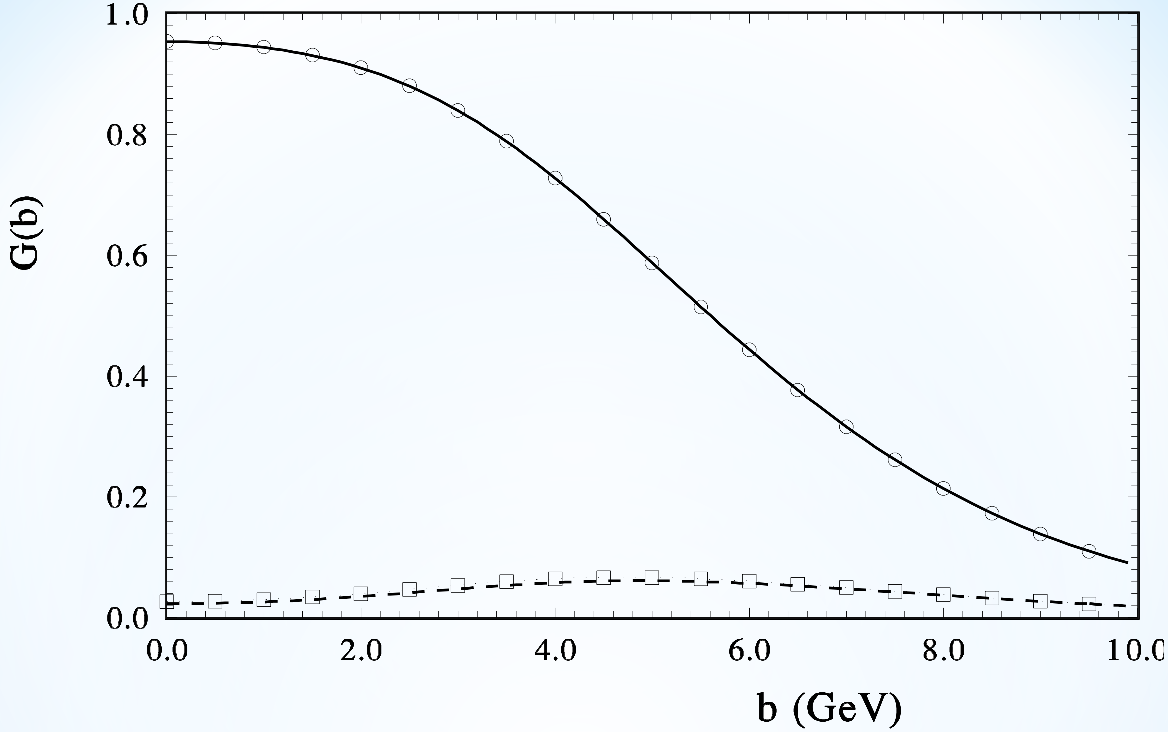
$\rho(s, t = 0)$;

hard line – pp;

dashed line – $p\bar{p}$;

Δ *and* ∇ *with* h^{C}_{Odd}.



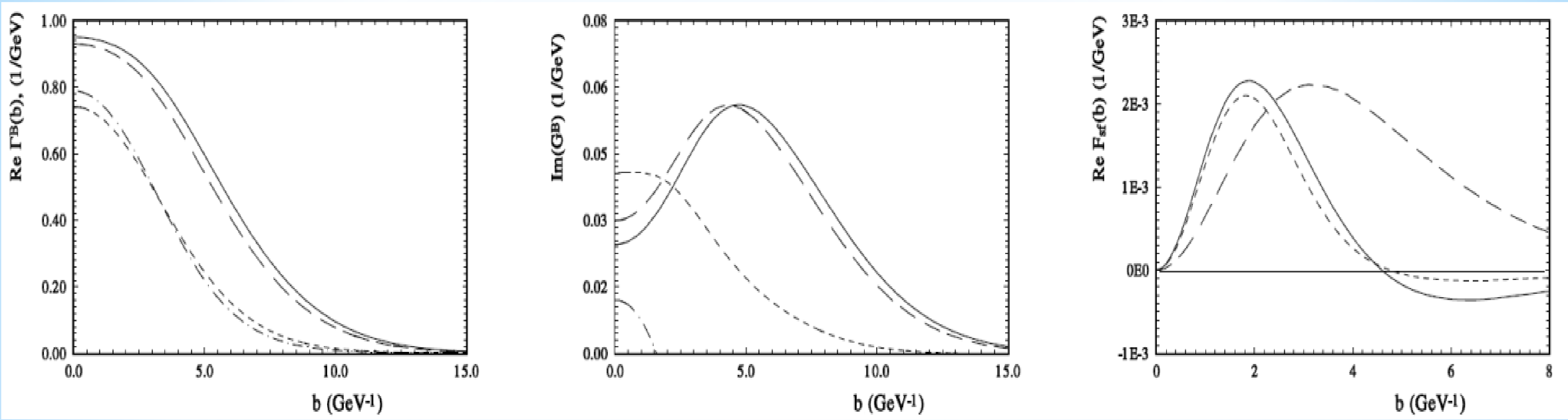


$The\ \ G(b)\, of\ \ \ pp\ \ at\ \sqrt{s} = 13 TeV$

$with\ h^{t}_{Odd}\ \ \ dashed\ \ line - \mathrm{Im}\, G(b);\ hard\, line\ \ \mathrm{Re}\, G(t);$

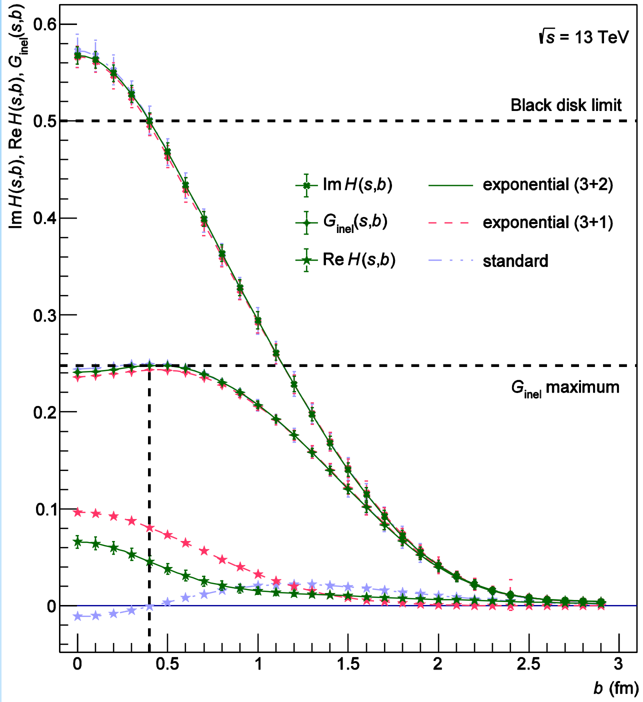
$with\ \ h^{C}_{Odd}\ and\ h^{t}_{Odd}\ \ (\square - \mathrm{Im}\, G(t);\ \ \mathrm{O} - \mathrm{Re}\, G(t));$

Extending of model (HEGS1) – O.V. S. Phys.Rev. D 91, (2015) 113003



The profile function $\Gamma(s,b)$: the real part (left) and imaginary part (middle) at energies s=9.8 GeV (dashed line), s=52.8 GeV (dash-dotted line), s=7 TeV (long dashed line), s=14 TeV (solid line).

he spin-flip amplitude in the b- representation (right) (solid line - eq.(12), dashed line - eq.(13) long dashed line - with q factor and normal exponential form



"New Physics" arXiv:1807.06471

A.Alkin, E.Martynov, O.Kovalenko, S.Troshin

$$\mathrm{Im}\,H(s,b=0) = 0.572 \pm 0.001;$$

$$\sigma_{tot} = 112.05 \pm 0.05; \;\; \rho(t=0) = 0.099 \pm 0.001;$$

TOTEM

$$\sigma_{tot} = 110.6 \pm 3.4\, mb; \;\; \rho(t=0) = 0.1 \pm 0.01;$$

$$F^h(s,t) = \frac{1}{2\pi}\int_0^\infty b\; J_0(bq)\; G(s,b)\, db$$

$$-t_1 \geq 0.0156\; GeV^2 - Coulomb \;\; free;$$

$$I_i = \sqrt{\frac{16\pi s^2}{k_{\mathrm{mb}}}\,\frac{d\sigma}{dt}\Big|_{t=t_i} - (\mathrm{Re}\,A(t))^2}. \qquad (12)$$

hence

$$I_i = |\,\mathrm{Im}\,A(t)\,|;$$

* Summary

1. $$\rho_{eik.}(\sqrt{s}=13TeV, t=0)=0.11\pm 0.015;$$

2. HEGSh model:

$$\rho_{HEGS}(\sqrt{s}=13TeV, t=0)=0.13\pm 0.015;$$
$$\sigma_{tot}(\sqrt{s}=13TeV)=106\pm 2.5\,mb;$$

3. B(t) – non-linear behavior (form factor, eikonalization);

4. The max-Odderon contribution at t=0 is very small;

5. The form of the diffraction minimum at 13 TeV shows the Odderon contribution;

   most important Odderon contribution at low energies and non-small t.

6. Eikonalization leads to Re (Odd $_{max}$) growth as Log(s/s0) ;

7. The standard eikonal approximation works perfectly

   from Sqrt(s}=9 GeV up to 13 TeV.

Thanks for Your attention

analysis 13 TeV

$$F^h(s,t) = (i+\rho)\frac{\sigma_{tot}}{4\pi\, 0.38938} e^{Bt/2}$$

σ_{tot}, mb	B(=0)	ρ(t=0)	n	$\Sigma\chi^2$
107.2 fx	18.23	-0.146	1. fx	377
110.6fx	20.17	0.024	1 fx	617
114.0 fx	21.7	0.103	1 fx	2253
111.8	20.78	0.086	1 fx	70.65
114.1	20.26	0.08	0.96	69.85

$$F^h(s,t) = (i+\rho)\frac{\sigma_{tot}}{4\pi\, 0.38938} e^{Bt/2} \quad f_{em}(t)^2;$$

σ_{tot}, mb	B(=0)	ρ(t=0)	n	$\Sigma\chi^2$
107.2 fx	9.82	-0.15	1 fx	436
110.6 fx	11.27	0.015	1 fx	954
114.0	12.9	0.114	1 fx	1827
112.1	12.02	0.098	1 fx	70.2
108.8	12.06	0.108	1.07	68.25

TOTEM 7 TeV

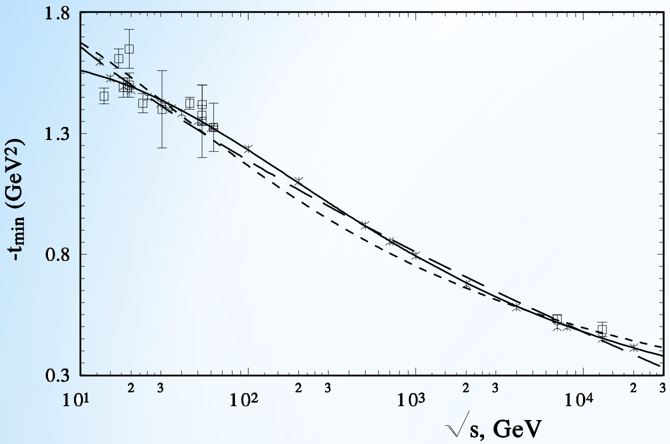
O.V. S.,"Total cross sections and ρ at high energy", Nucl. Phys. A 922, 180-190, 2014.

N	$\sum_{i=1}^{N} \chi_i^2$	ρ	B	C	n	σ_{tot}, mb
47	77.84	0.14fixed	20.0	$0. - fix$	1.05	96.8 ± 0.1
47	71.65	$0.1ffix$	20.	$0.fix$	1.05	97.1 ± 0.1
47	66.3	$0.05fix$	20.	$0.fix$	1.05	97.2 ± 0.1
47	62.8	$0.fix$	19.4	$0.fix$	1.05	97.1 ± 0.1
47	63.1	0.14fixed	17.2	2.1 ± 0.5	1.05	97.56 ± 0.2
47	61.9	$0.1fix$	17.7	1.87 ± 0.5	1.05	97.7 ± 0.2
47	61.0	$0.05fix$	18.2	1.24 ± 0.5	1.05	97.7 ± 0.2
47	60.6	$0.fix$	18.8	0.8 ± 0.5	1.05	97.4 ± 0.2
47	60.8	$-0.05fix$	19.3	0.4 ± 0.5	1.05	96.9 ± 0.3
47	61.1	-0.064 ± 0.05	19.8	$0.fix$	1.05	96.57 ± 0.58
47	60.6	-0.011 ± 0.09	18.9	0.7 ± 0.9	1.05	97.3 ± 0.9

Table 10: The basic parameters of the model are determined by fitting experimental data.

“Now our calculations show the inconsistency of the size of \rho=0.14 with the parameters of the scattering amplitude obtained by the TOTEM Collaboration.”

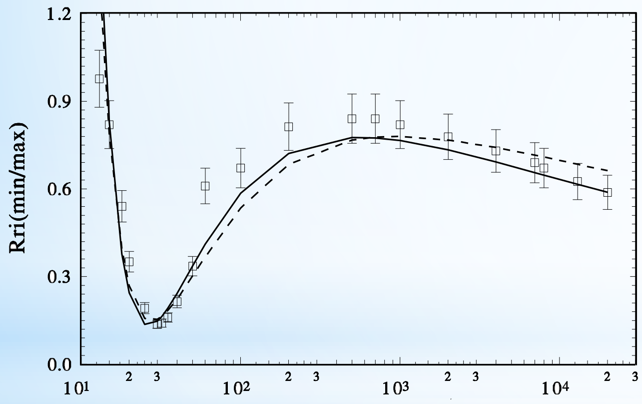
O.V.S. – Nucl.Phys. A (2016)

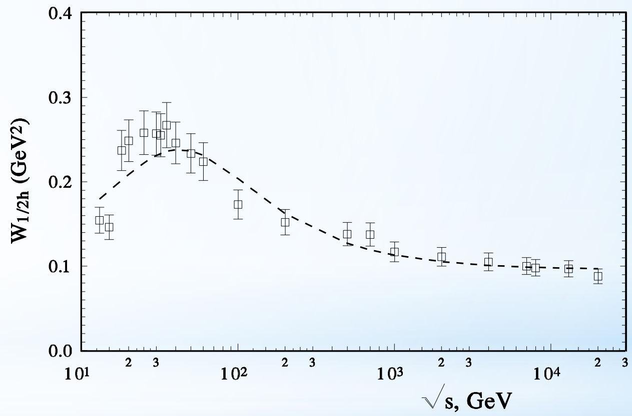


$$t_{\min} = a_1 / [(1 + a_2 \ln(s/s_0)^2];$$

$$a_1 = 1.85 \pm 0.08; \; a_2 = 0.009 \pm 0.001; \; s_0 = 4m_p.$$

tm2





Whh

$$R_{\frac{\max}{\min}} = \frac{b_1}{\ln(s/s_0)^2}[b_3 + (b_2 - \frac{1}{\ln(s/s_0)})^2];$$

$$W_{1/2h} = c_1 + c_2 / (c_4 / \sqrt{s} + (\sqrt{s})^{\varepsilon}];$$

Rinv

BSW_1 - C. Bourrely, J. Soffer, T.T. Wu - ( )

BSW_2 - C. Bourrely, J. Soffer, T.T. Wu - ( )

$HEGS_0$ – O.V.S. -

$HEGS_1$ – O.V.S. -

	BSW_1	BSW_2	$HEGS_0$	$HEGS_1$
N_{exp}	369	955	980	3416
N_{par}	7+Regge	11+Regge	3+2	5+4
$\sqrt{s}$, GeV	24 ÷ 630	13.4 ÷ 1800	52 ÷ 1800	9 ÷ 8000
Δt, GeV^2	0.1 ÷ 2.6	0.1 ÷ 5	$8.7\cdot10^{-4}$÷ 10	$3.7\cdot10^{-4}$÷ 15
$(\Sigma x^2)/N$	4.45	1.95	1.8	1.28

$F^{B}_{Odd}(s,t)$ *with* $h^{c}{}_{Odd}$ *and* $h^{t}{}_{Odd}$

$F^{B}_{Odd}(s,t)$ *with* $h^{t}{}_{Odd}$