A tribute in memory

of

Aliosha Kaidalov

(1940 - 2010)

Aliosha made many pioneering contributions to the understanding of diffractive processes in high-energy hadron interactions:

He was the first to evaluate the effects low mass (N*) diffraction (1971)

Kaidalov et al. performed the first triple-Regge analysis (1973)

PHYSICS REPORTS (1979)

DIFFRACTIVE PRODUCTION MECHANISMS

A.B. KAIDALOV

Institute of Theoretical and Experimental Physics, Moscow, USSR

Received 14 July 1978

Contents:

Pioneering model for soft high-energy hadron interactions

A.B. Kaidalov, L.A. Ponomarev, K.A. Ter-Martirosyan

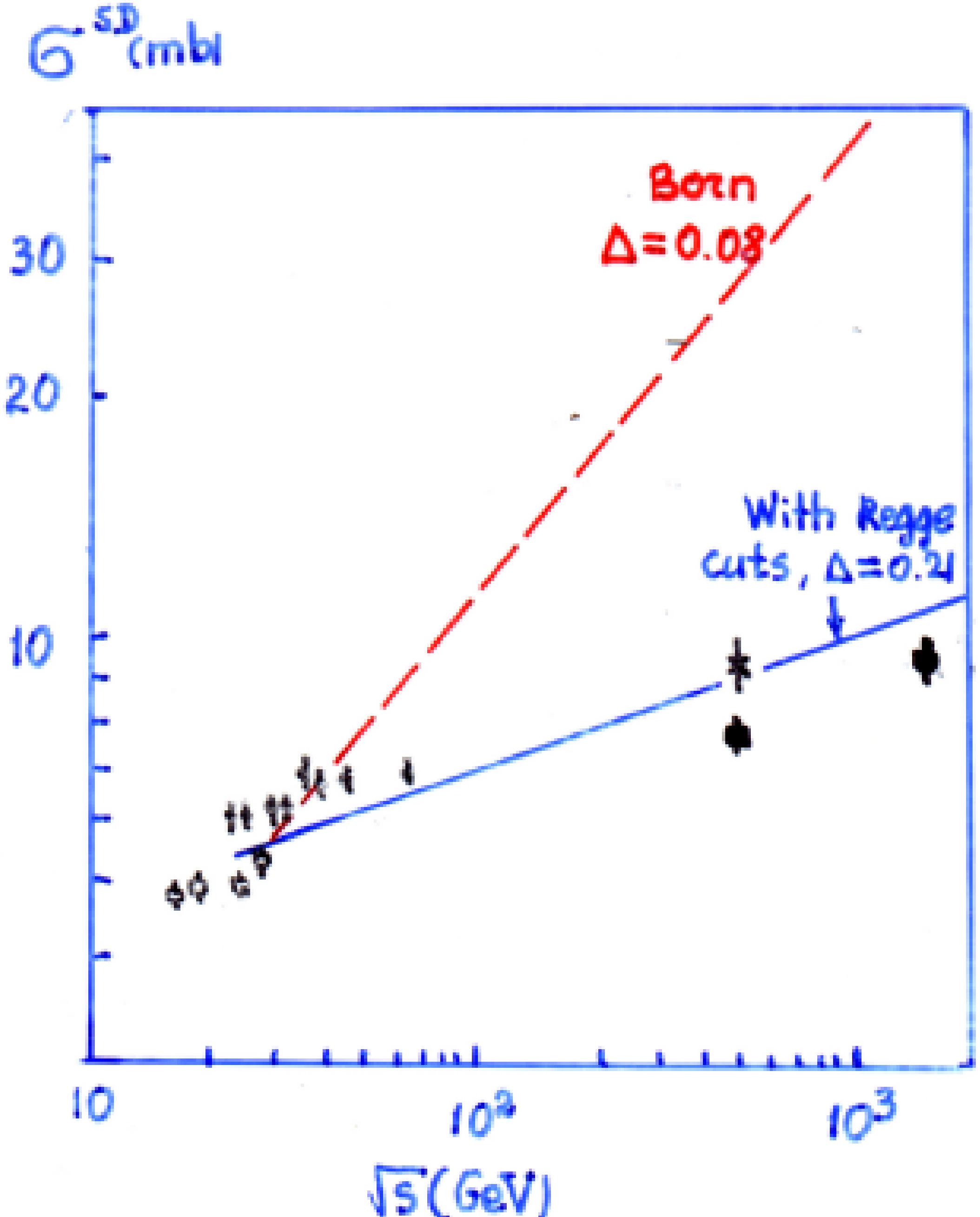
Sov. J. Nucl. Phys. 44 (1986)

included multi-Pomeron diagrams in global description,
for first time, with vertices

$$g(nP \rightarrow mP) = g_N \lambda^{n+m-2}$$

……..2007-10

M. Poghosyan, A.B. Kaidalov



the effect of the unitarity corr^{ns} via multi-Pomeron diagrams

Diffractive Dissociation of Hadrons and Photons at High Energies.

A.B. Kaidalov
ITEP, Moscow

Diffraction 2000
September 2-7
Cetraro, Italy

Content

- Introduction.
- Pomeron in QCD.
- Diffractive processes in hadronic interactions. Models and experim.
- Diffraction in γp and DIS.
  Shadowing for nuclei.
- Conclusions.

- ## Pomeron in QCD

It is usually assumed that the Pomeron in QCD is related to gluonic exchanges in the t-channel.
(exchange by 2 gluons leads to a singularity at $j=1$).

But what is an influence of confinement? Are there glueballs on the Pomeron trajectory?

Recently we have studied these problems with Yu. Simonov. (hep-ph/9911291, 9912434, Phys. Lett. 2000)

The spectrum of glueballs has been calculated using the nonperturb. method of Wilson loop path integrals. The main assumption is:

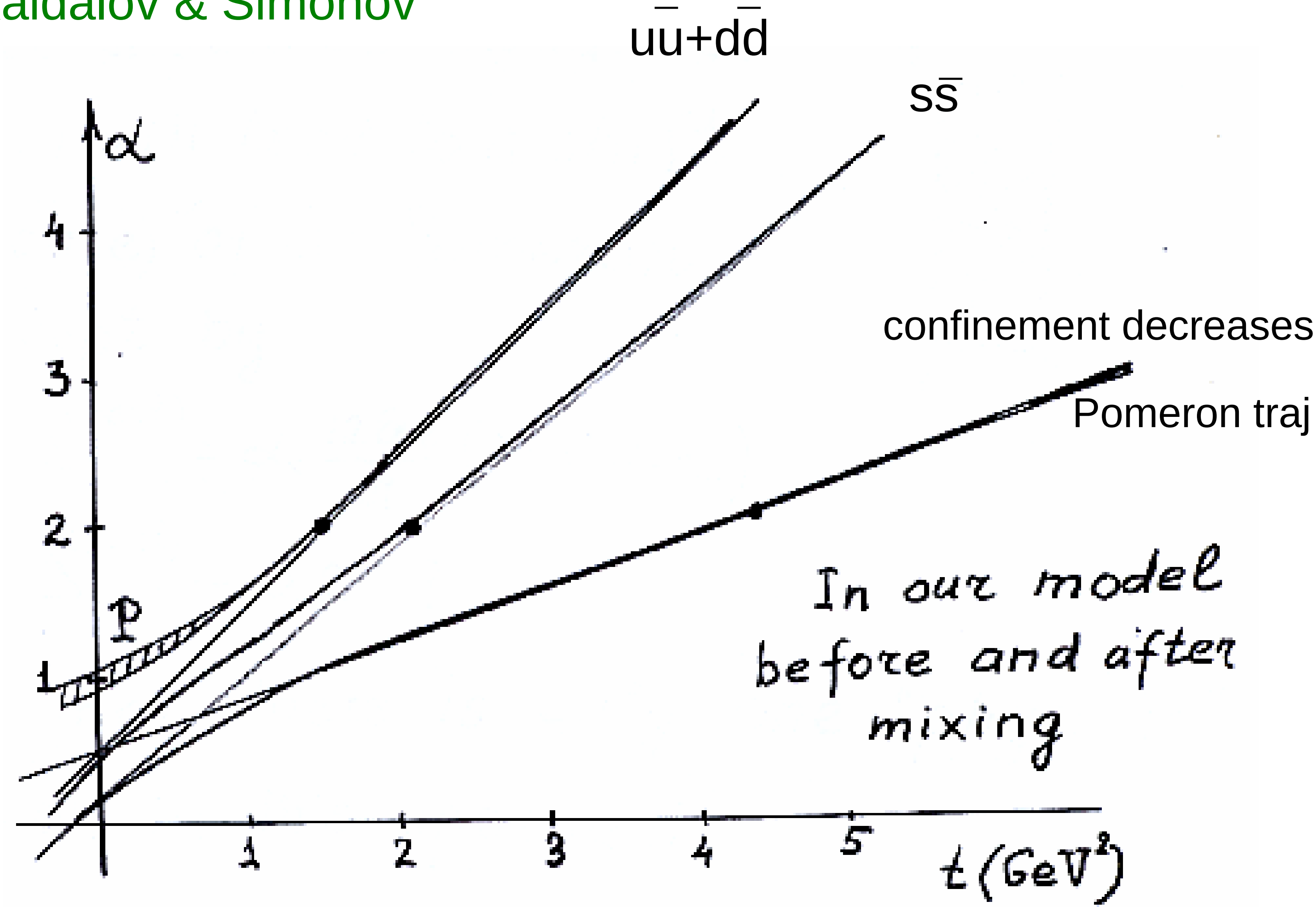
area law for Wilson loops at large distances. $\langle W \rangle \sim \exp(-\sigma_{adj} S_{min})$

Kaidalov & Simonov

M (GeV)

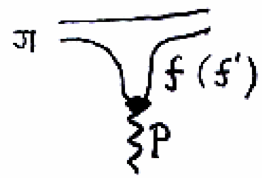
J^{PC}	This work	Lattice data	
		C.M., M.P.	M. Teper
0^{++}	1.58	1.73 ± 0.13	1.74 ± 0.05
0^{++*}	2.71	2.67 ± 0.31	3.14 ± 0.10
2^{++}	2.59	2.40 ± 0.15	2.47 ± 0.08
2^{++*}	3.73	3.29 ± 0.16	3.21 ± 0.35
0^{-+}	2.56	2.59 ± 0.17	2.37 ± 0.27
0^{-+*}	3.77	3.64 ± 0.24	
2^{-+}	3.03	3.1 ± 0.18	3.37 ± 0.31

Kaidalov & Simonov



Kaidalov
Simonov

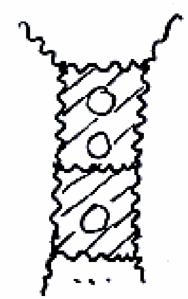
A simple model for mixing matrix,- $f(f')$ dominance of residues



Resulting Pomeron intercept close to 1 $(0.9 < \alpha_P(0) < 1.1)$

This is nonperturbative contribution

Small distance dynamics (BFKL) will lead to a shift (increase) of the Pomeron intercept by



$$\Delta^{(pert)} = \alpha_s \frac{12 \ln 2}{\pi} (1 - C\alpha_s + \ldots)$$

$$\Delta^{(pert)} \sim 0.2 \quad ?$$

Note that there is only one "physical" Pomeron in this approach.

Light quarks are important for intercept and slope of the Pomeron

In the 1990's on….

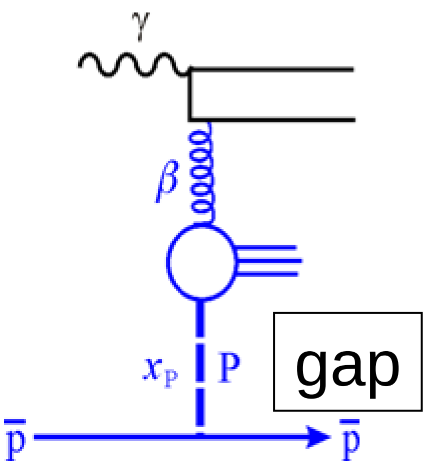
Kaidalov and Orsay collaboration (Capella, Tran Thanh Van…..)

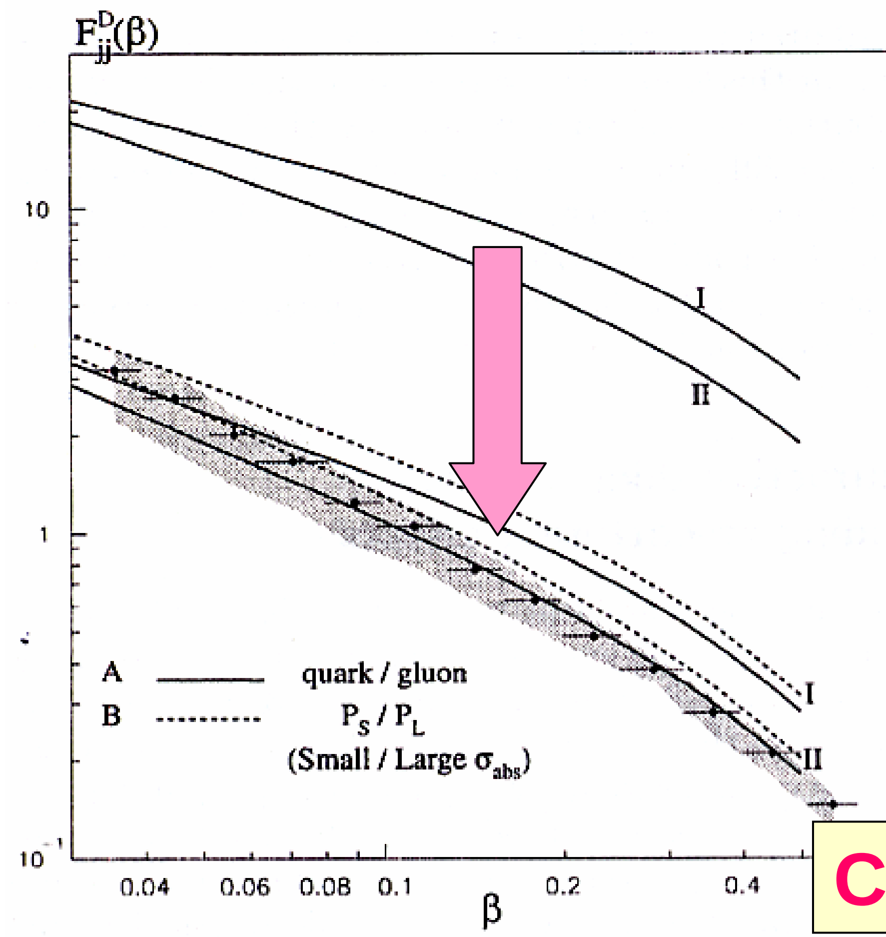
From 2001 on…..

Kaidalov and Durham (KMR) collaboration

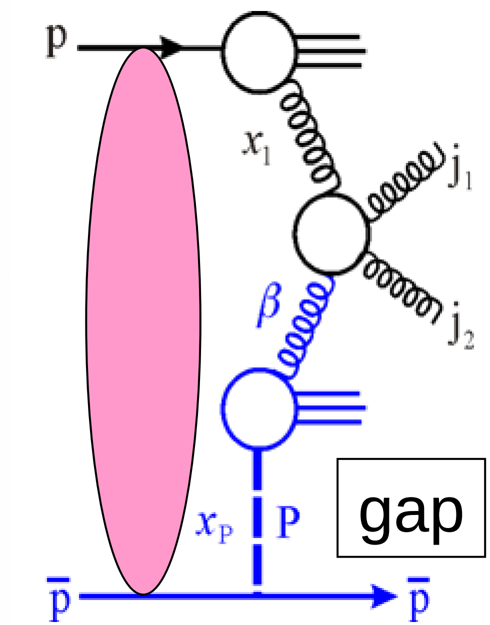
More recently…. with the ALICE collab^{n} at LHC

Kaidalov et al.   EPJC (2001)





soft rescatt.



CDF diff^{ve} dijets

HERA→diff^{ve} PDFs

CDF data

$E_T^{Jet1,2} > 7$ GeV

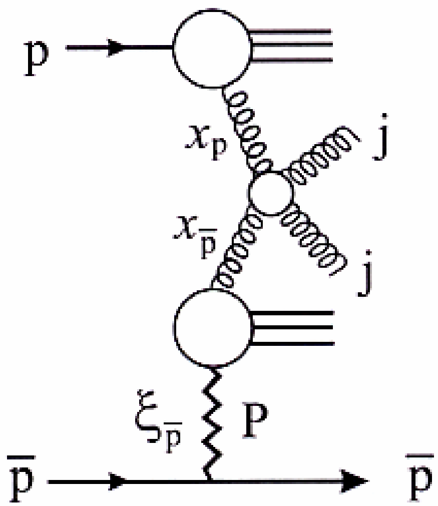
$0.035 < \xi < 0.095$

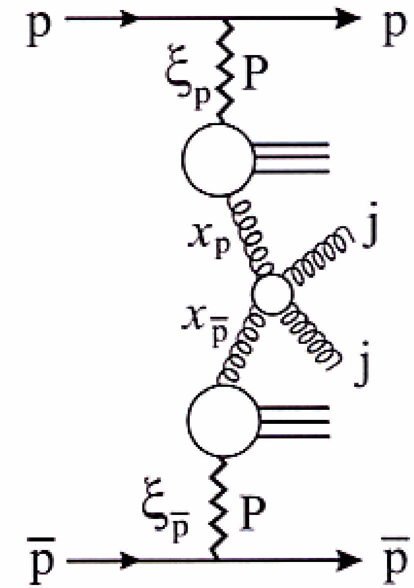
$|t| < 1.0$ GeV^2

Paper also discussed possible β dependence, and emphasized enhanced rescatt. effects

A.B. Kaidalov et al. / Physics Letters B 559 (2003)

Dijet production at the Tevatron



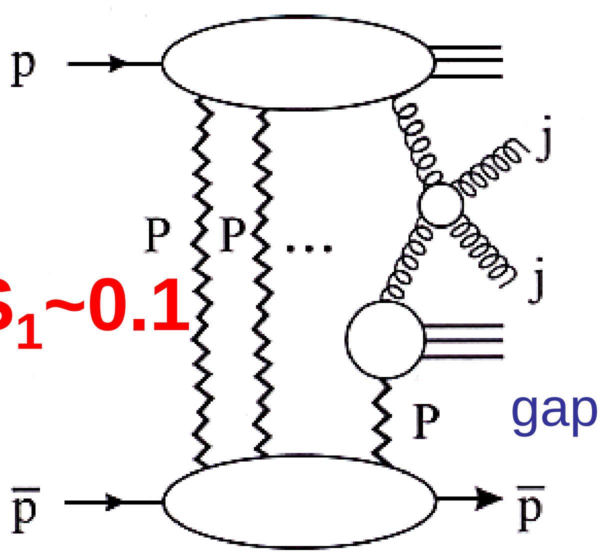


SD

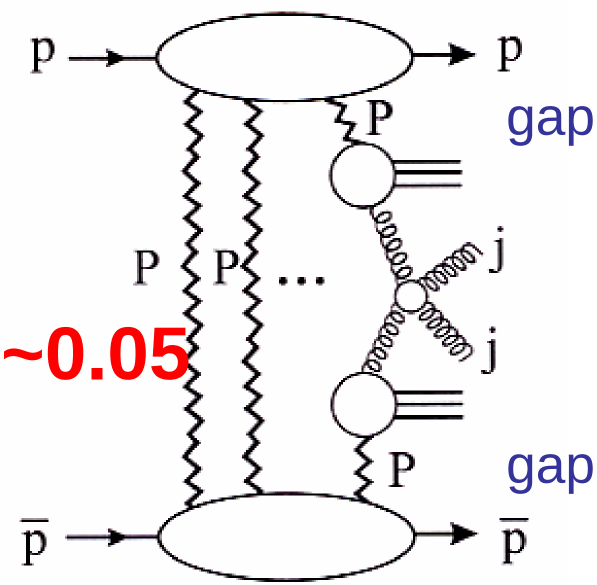
DPE

Survival prob. of gaps:

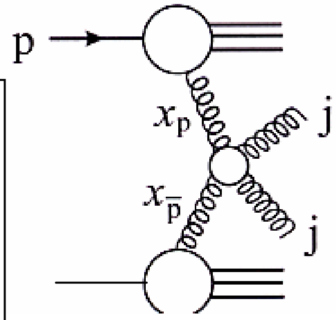
S_1~0.1



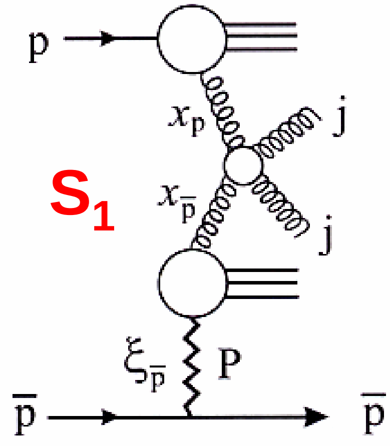
S_2~0.05



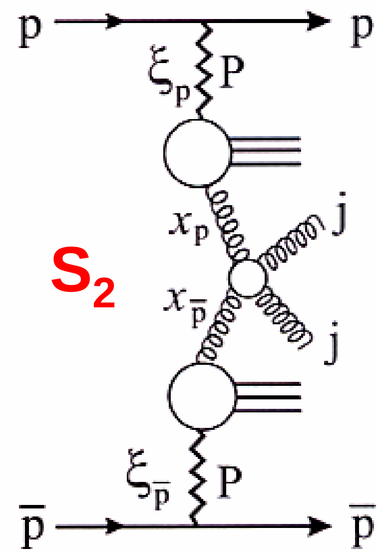
F_P is Pomeron "flux factor"
ξ is fraction of incoming mom. carried by Pom.
$x = \beta\xi$
f are the effective PDFs



ND



SD



DP

$$R^{SD}_{ND} \equiv \frac{\sigma^{SD}_{jj}}{\sigma^{ND}_{jj}} = \frac{F_P(\xi_{\bar{p}}) f_P(\beta)\beta}{f_{\bar{p}}(x_{\bar{p}}) x_{\bar{p}}} S_1$$

$$R^{DP}_{SD} \equiv \frac{\sigma^{DP}_{jj}}{\sigma^{SD}_{jj}} = \frac{F_P(\xi_p) f_P(\beta_1)\beta_1}{f_p(x_p) x_p} \frac{S_2}{S_1}$$

Need same kinematics.
Uncertainities cancel.
Could study $S(\beta)$

$$D = \frac{R^{SD}_{ND}}{R^{DP}_{SD}} = \frac{F_P(\xi_{\bar{p}}) f_P(\beta)\beta}{F_P(\xi_p) f_P(\beta_1)\beta_1} \frac{f_p(x_p) x_p}{f_{\bar{p}}(x_{\bar{p}}) x_{\bar{p}}} \frac{S_1^2}{S_2}$$

$= S_1^2/S_2$ (if $\beta=\beta_1$, same ξ)

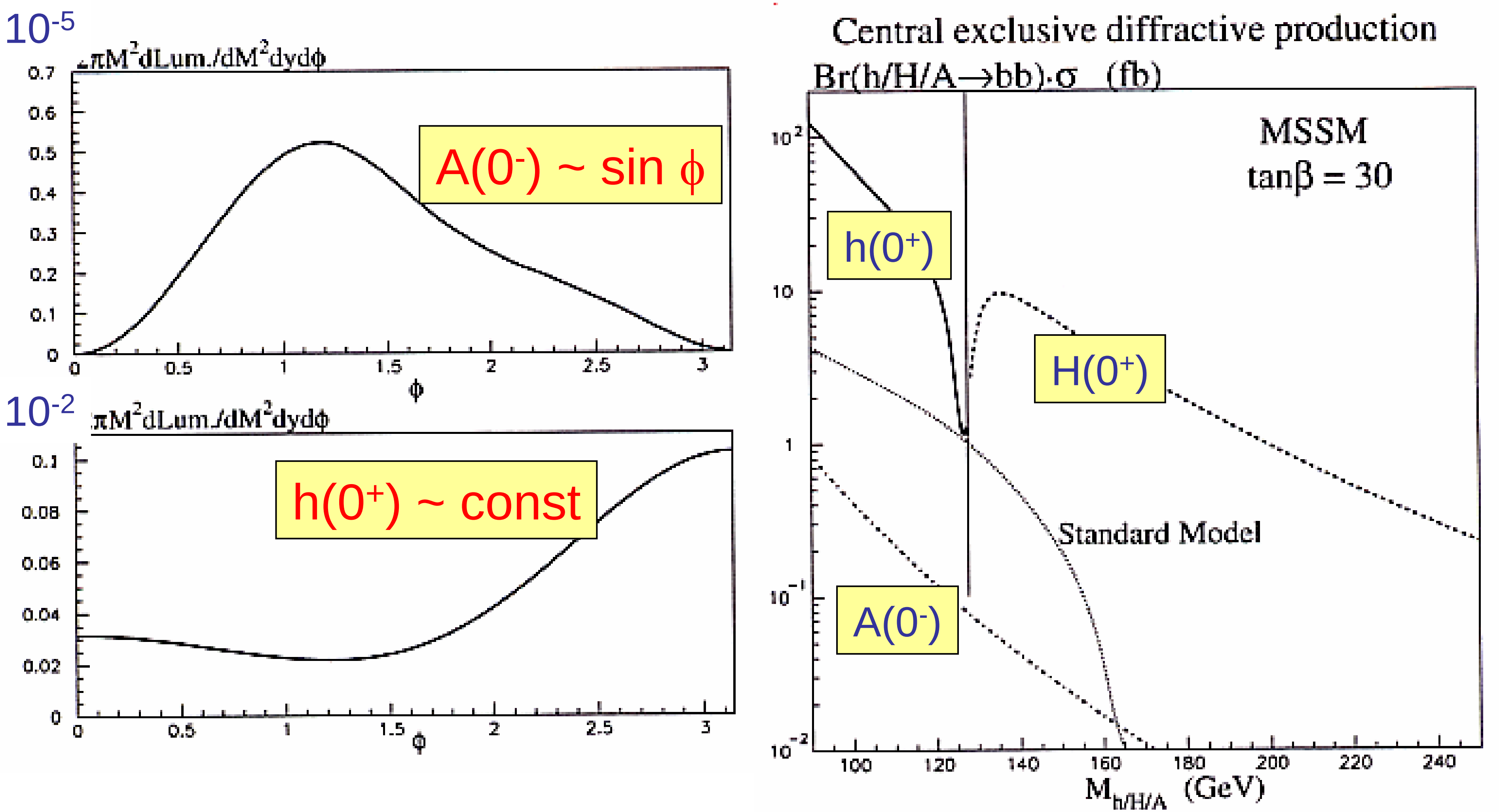
$\sim 0.1^2/0.05 = 0.2$

CDF data $D = 0.19 +/- 0.07$

Exclusive SUSY Higgs: pp → p + (h, H, A) + p

2003

394 A.B. Kaidalov et al.: Central exclusive diffractive production as a spin–parity analyser: from hadrons to Higgs



Factorisation breaking in diffractive dijet photoproduction at HERA

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Abstract We discuss the factorisation breaking observed in diffractive dijet photoproduction by the H1 and ZEUS collaborations at HERA. By considering the effects of rapidity gap survival, hadronisation, migration and NLO contributions, we find that the observed data are compatible with theoretical expectations.

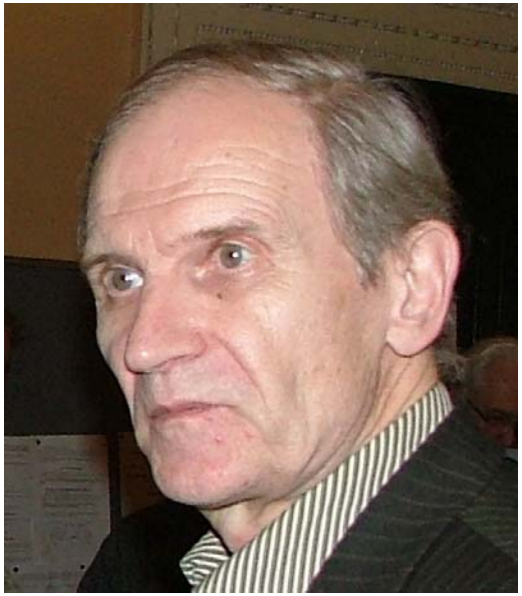
stimulated by discussions between Alice Valkarova and Aliosha et al. at the “low x” meeting in Ischia, Italy, this time last year

Kaidalov et al. (2003)

Kaidalov et al. (2010):

In summary, the hadron-like component of the resolved photon, which is suppressed by a factor $\boxed{S^2 \simeq 0.34}$ [14], only starts to be important for small x_γ. Indeed, to feel the hadron-like component one needs to observe dijets far in rapidity from the photon, corresponding to $x_\gamma < 0.1$. This region was difficult to access at HERA.[10] The point-like component of the resolved photon, which is calculable perturbatively, is the dominant one for $x_\gamma > 0.1$, and has a small suppression. For this component, the spectator partons have third jet. Finally, after including the direct component and taking into account the effects of hadronisation and migration, we find that our expectations are consistent with the observed data for diffractively photo-produced dijets.

We will all miss **Aliosha Kaidalov**



for his wide and deep knowledge

for his modesty, and his patience and care
of others less brilliant than himself

for his quiet humour and distinctive chuckle

for his singing, that has enriched many a conference dinner

for his calm and stoical approach to his illnesses

but above all for his humanity, for his friendship to those who
were fortunate enough to meet him. A life so well-lived

A wonderful person.   He will be greatly missed