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 of low mass (N*) diffraction (1971)

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

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Received 14 July 1978

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Pioneering model for soft high-energy hadron interactions

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


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 corrections via multi-Pomeron diagrams
Diffraction 2000
September 2-7
Cetraro, Italy

A.B. Kaidalov
ITEP, Moscow

Content

- Introduction.
- Pomeron in QCD.
- Diffractive processes in hadronic interactions. Models and experiment.
- Diffraction in $^3\text{He}$ 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/9912291, Phys. Lett. 2000)

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

area law for Wilson loops at large distances: $\langle W \rangle \sim \exp(-c_{adj} S_{min})$
<table>
<thead>
<tr>
<th>J P C</th>
<th>This work</th>
<th>Lattice data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>C.M., M.P.</td>
</tr>
<tr>
<td>0^{++}</td>
<td>1.58</td>
<td>1.73 ± 0.13</td>
</tr>
<tr>
<td>0^{++*}</td>
<td>2.71</td>
<td>2.67 ± 0.31</td>
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<tr>
<td>2^{++}</td>
<td>2.59</td>
<td>2.40 ± 0.15</td>
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<tr>
<td>2^{++*}</td>
<td>3.73</td>
<td>3.29 ± 0.16</td>
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<tr>
<td>0^{-+}</td>
<td>2.56</td>
<td>2.59 ± 0.17</td>
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<tr>
<td>0^{--*}</td>
<td>3.77</td>
<td>3.64 ± 0.24</td>
</tr>
<tr>
<td>0^{--}</td>
<td>3.03</td>
<td>3.1 ± 0.18</td>
</tr>
</tbody>
</table>
Kaidalov & Simonov

\[ uu + dd \]

\[ ss \]

confinement decreases

Pomeron traj

In our model before and after mixing
A simple model for mixing matrix, $f(s')$ 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

$$\Delta^{(pert)} = \alpha_{s} \frac{12 \pi m_{2}}{\Gamma} (1 - C \alpha_{s})$$

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

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\textsuperscript{n} at LHC
Paper also discussed possible $\beta$ dependence, and emphasized enhanced rescatt. effects
Dijet production at the Tevatron

Survival prob. of gaps:

$S_1 \approx 0.1$

$S_2 \approx 0.05$
FP is Pomeron “flux factor”
ξ is fraction of incoming mom. carried by Pom.
x = βξ
f are the effective PDFs

CDF data
D = 0.19 +/- 0.07

Need same kinematics.
Uncertainties cancel.
Could study S(β)

S_1 \sim 0.12/0.05 = 0.2
Exclusive SUSY Higgs: \( pp \rightarrow p + (h, H, A) + p \)

\[ A(0^-) \sim \sin \phi \]

\[ h(0^+) \sim \text{const} \]

Central exclusive diffractive production

\[ \text{Br}(h/H/A \rightarrow bb) \cdot \sigma \text{ (fb)} \]

MSSM
\( \tan \beta = 30 \)

Standard Model

\[ M_{h/H/A} \text{ (GeV)} \]
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 HI 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. (2010):

In summary, the hadron-like component of the resolved photon, which is suppressed by a factor $S^2 \simeq 0.34$ [14], only starts to be important for small $x_\gamma$. 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. 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