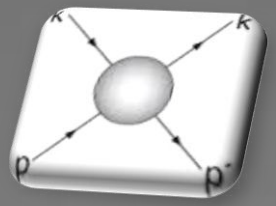
Does Confinement Influence High-Energy Scattering?



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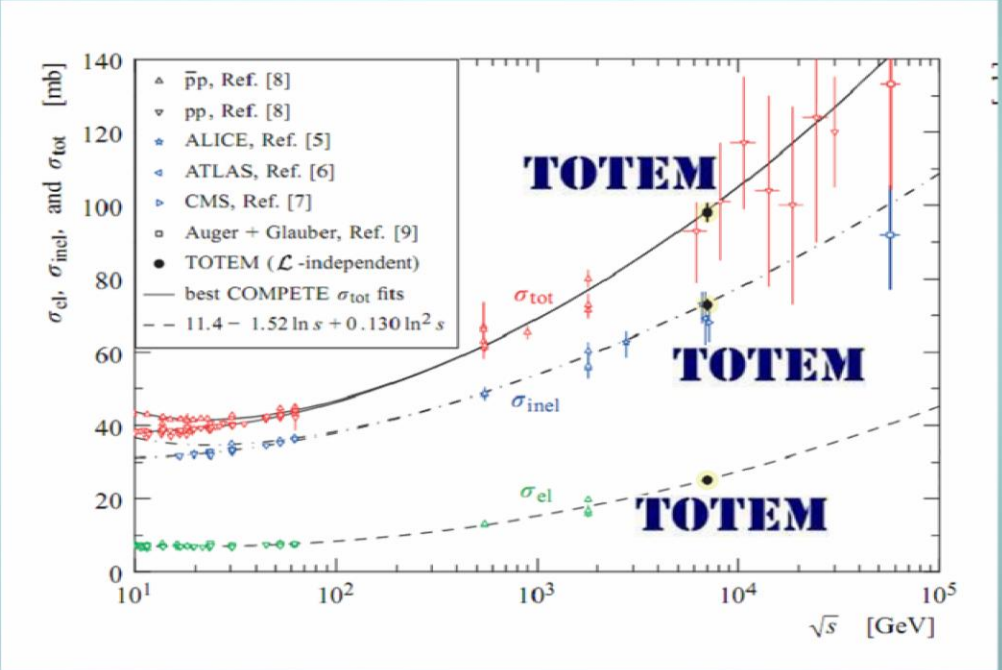
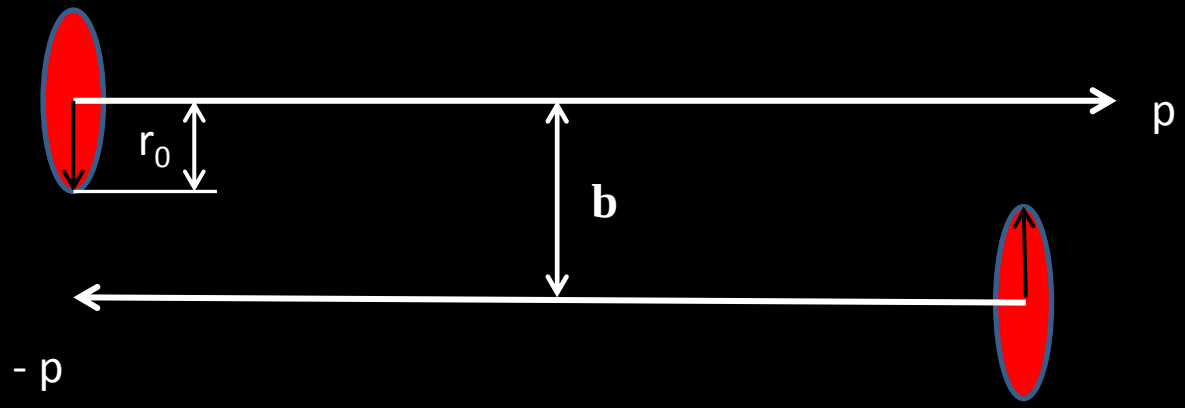
High-Energy Scattering 2014

Cross-sections vs Energy



Geometry of High-Energy Scattering



$$d\sigma/dt \sim |T(s,t)|^2 \sim e^{Bt},$$

$$< b^2> = \tfrac{1}{2} d(d\sigma/dt)/dt \ @\ t = 0$$

$$< b^2>_{min} = 2\, r_0^2$$

$$r^2_0 \approx (0.66\ \text{fm})^2 \approx 10.79\ \text{GeV}^{-2}$$

$$< r_{||}> = 2p < \partial\, [\arg T(s,t)]/\partial t >$$

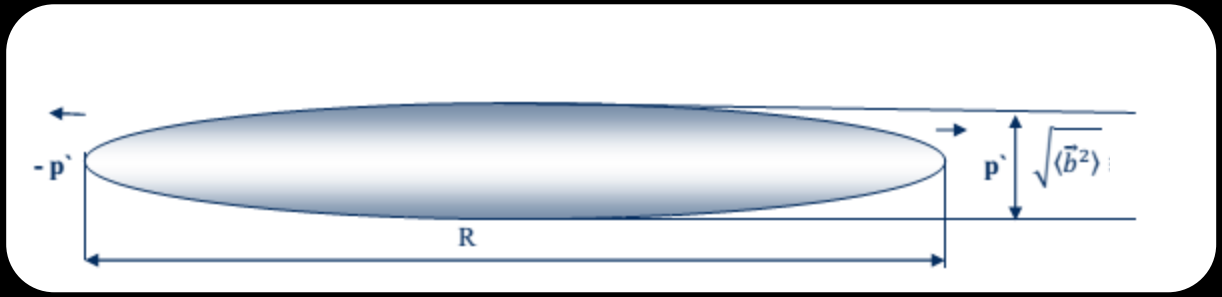
Shape and Size

"Theory":

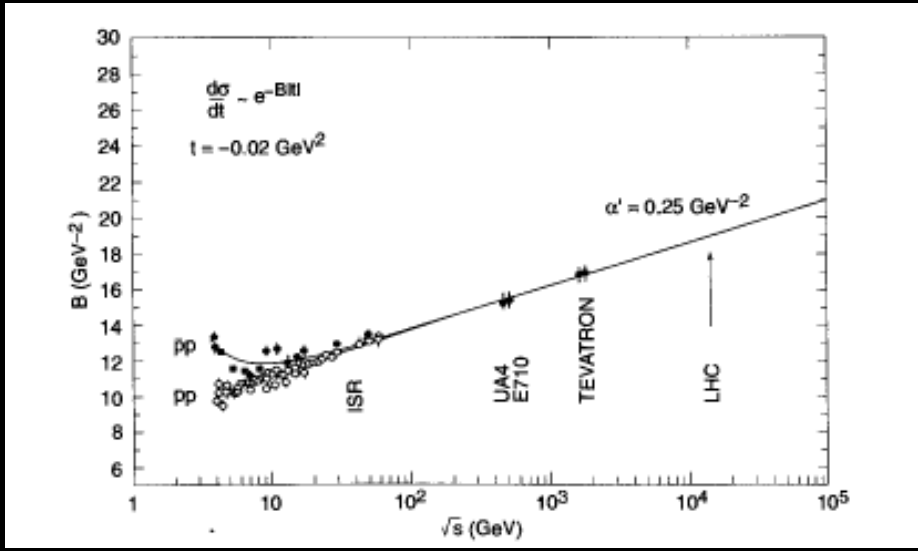
$$T(s,t) = \beta(t)(s\, e^{-i\pi/2})^{\alpha(t)}$$

$$<b^2> = 4\,\alpha`(0)\log(s/s_0) + 2\,r^2_0$$

$$R = < r_{||}> = 2p<\partial\, \arg T(s,t)/\partial t>=$$
$$= \pi\alpha`(0)p \approx \pi\alpha`(0)\sqrt{s}$$



Data

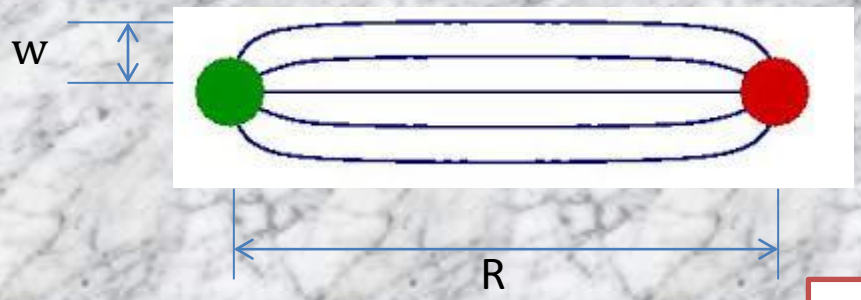


< b^2> - evolution with energy (2B= <b^2>)

<b^2>$^{1/2}$ (Tevatron, 2TeV) ≈ 1.17 fm

R (Tevatron) ≈ 160 fm

Static String-like Confinement



$w^2 = [(D-2)/2\pi\sigma] \ln R + \ldots$

M.Lűscher et al.(1981)

$1/2\pi\sigma = \alpha'$

D=4

$w^2 = \mathbf{2}\alpha' \ln R + \ldots$

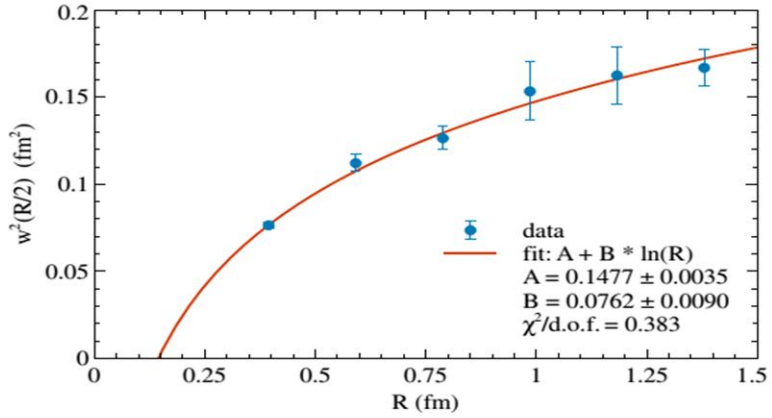


Fig. 2. The width squared of the $q\bar{q}$ confining string as function of its length [2].

N. Cardoso et al.(2013)

Scattering vs String

$<b^2> = 4\,\alpha`(0)\log(s) + \ldots$

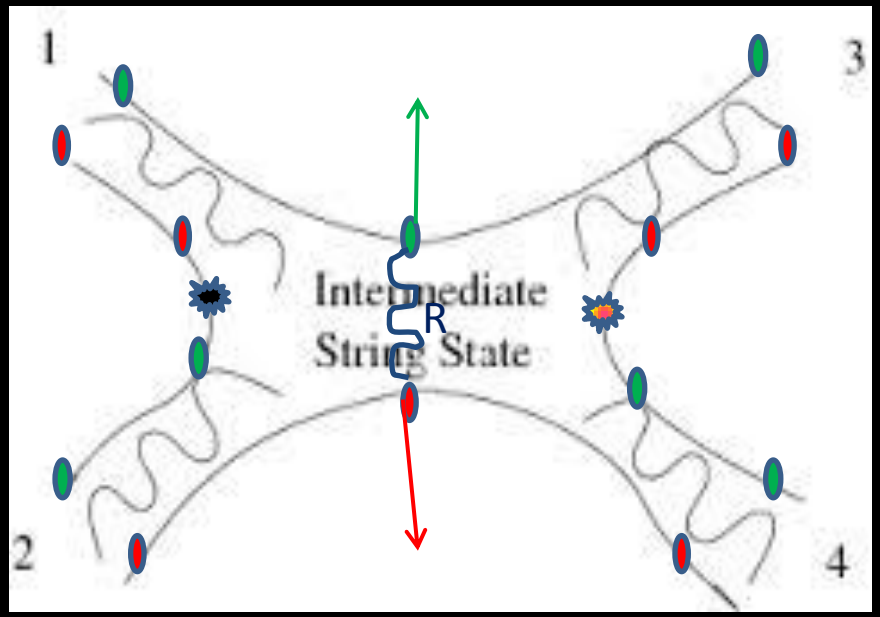
$R \approx \pi\alpha`(0)\sqrt{s} + \ldots$

$s \sim R^2$

$$w^2_{scat} = \frac{\langle \vec{b}^2 \rangle}{4} = 2\alpha'(0)ln(R)$$

$w^2_{string} = 2\alpha`\ln(R)$

"Before it Breaks": How much can be stretched the string?

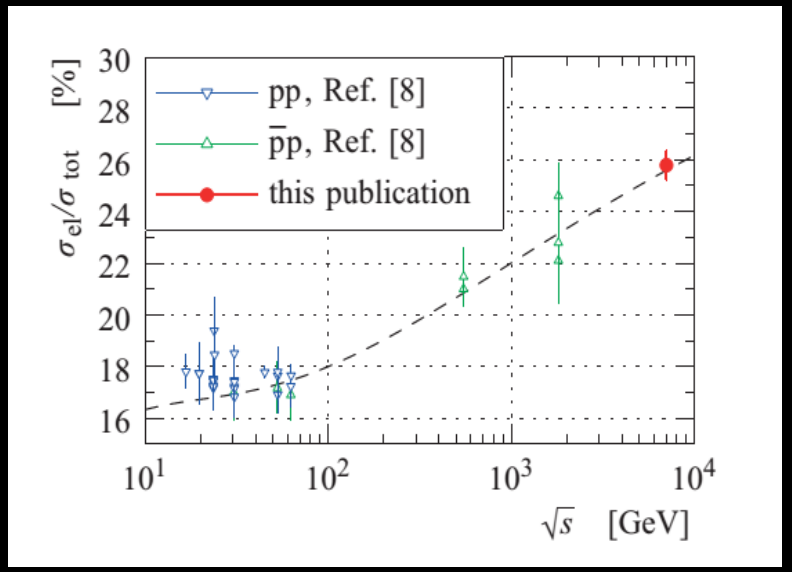


"Survival probability" of the long ($O(10^2$ fm) flux = σ_{el}/σ_{tot}

R = 160 fm, M = 2000 GeV/c^2

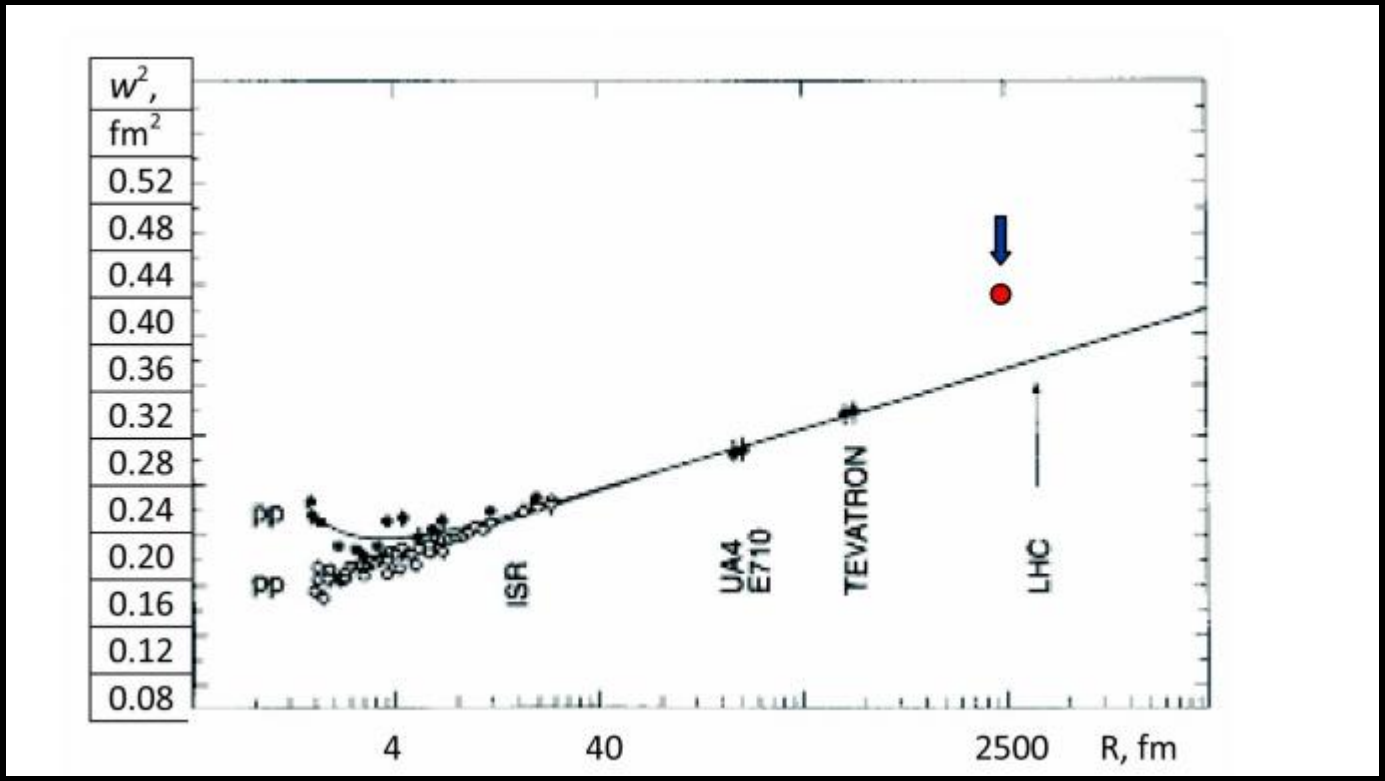
R = 1 fm

R = 1 fm



σ_{el}/σ_{tot} = 23% @Tevatron

LHC: Spoiling or Modifying?



$R \approx \pi\alpha`(0)[\alpha(0)-1]\log(s)\sqrt{s} + \ldots$

$<b^2> = 4\,\alpha`(0)\,[\alpha(0)-1][\log(s)]^2 \ldots$

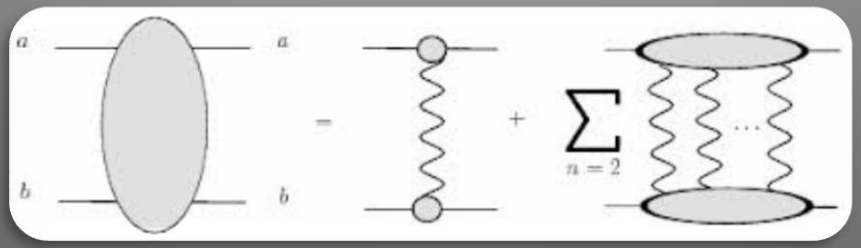
$w^2 = 2\alpha` \ln R + \ldots$

???

$w^2 = 4\alpha`\Delta\,(\ln R)^2 + \ldots$

Backward Turn: from HEPSC to Strings

- Higher energies : multi-Reggeon exchanges



- Strings: averaging in all genera

$$<<W^2>> = \sum P_n <W^2>_n \; ? = ? \; 4\alpha` \Delta \, (\ln R)^2$$