

Hybrid Pomeron Model of Hard Central Exclusive Diffraction

Robi Peschanski ^a

(IPhT, Saclay)

LOW-x WORKSHOP,

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- Motivation

A two-time-scale process

- Formulation

“Hybridation” of the B-L Approach

- Results

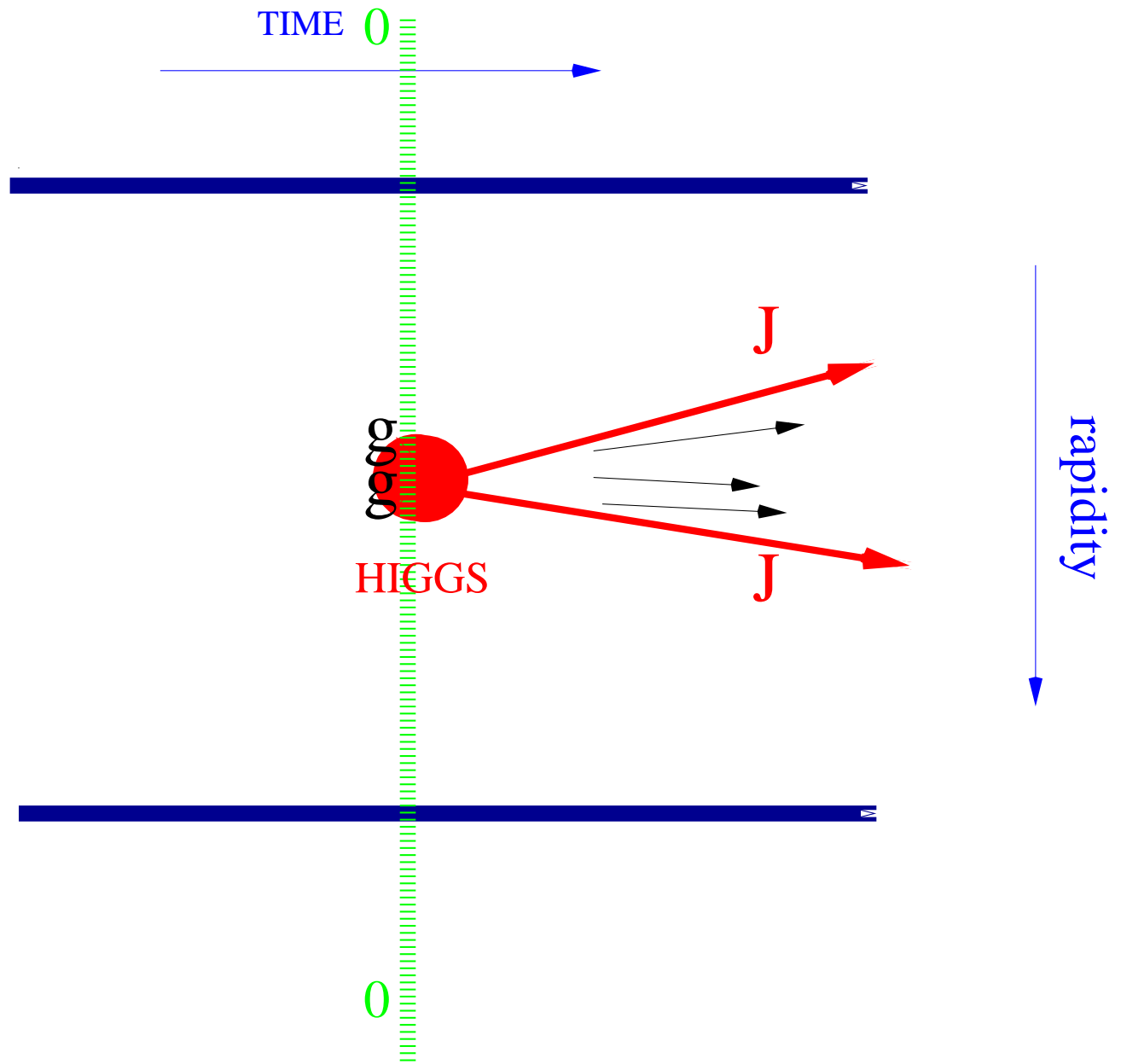
Dijets and the Higgs Boson

- Prospects

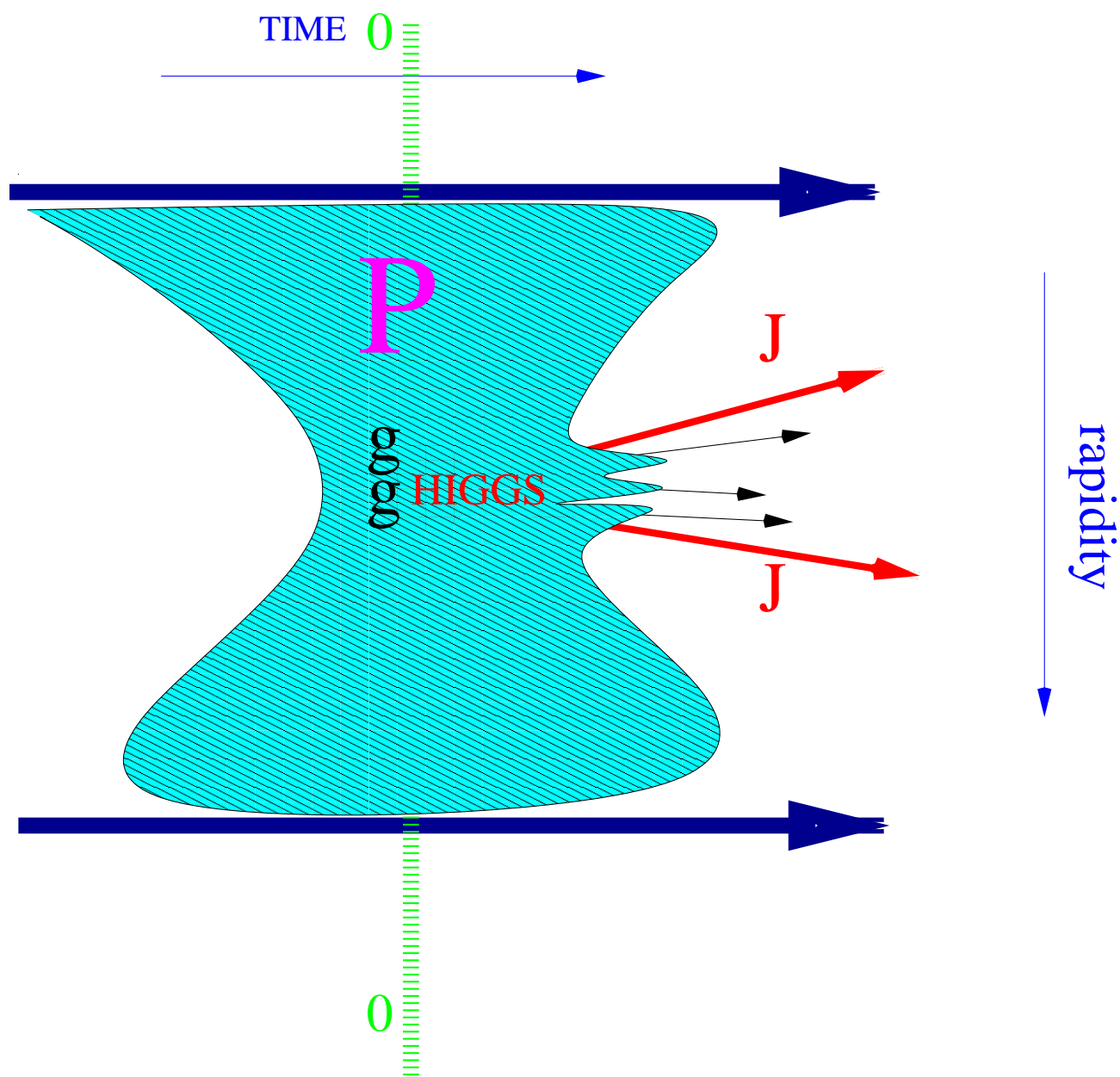
The LHC !

^awith Murilo Rangel (CBPF,Rio), Christophe Royon (IRFU,Saclay) ,
to appear

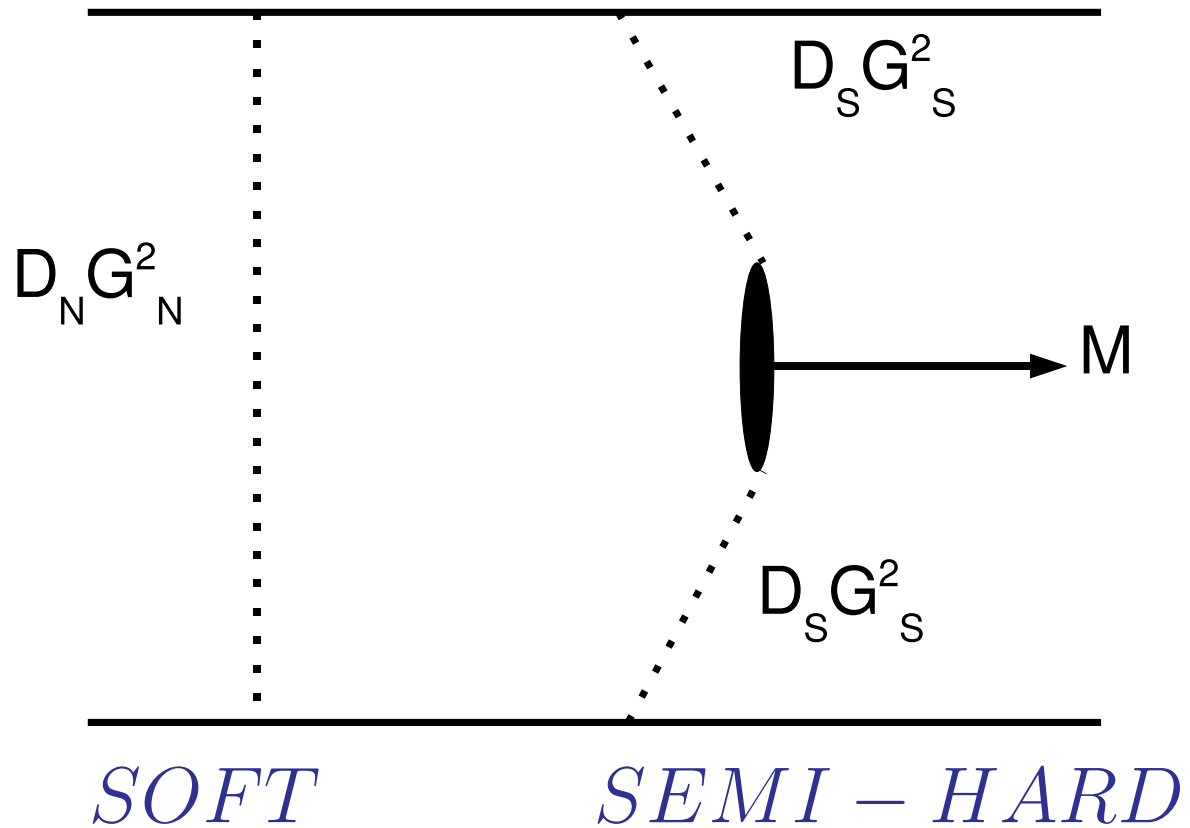
Hard central Diffraction:



A two-time-scale process



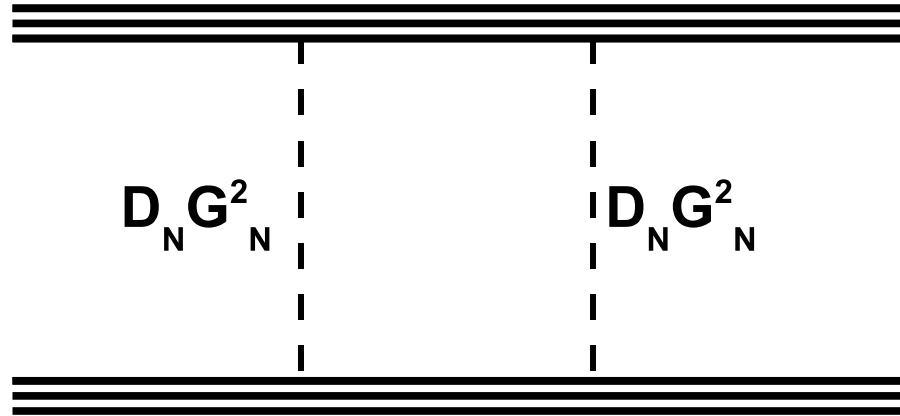
The “Hybrid” Skeleton



$$D_{N,S} G_{N,S}^2 = D_{N,S}^{(0)} G_{N,S}^2 \exp(-k_T^2 / \mu_{N,S}^2)$$

SOFT COLOR EXCHANGE

- The Elastic $p-p$ Cross-Section ...



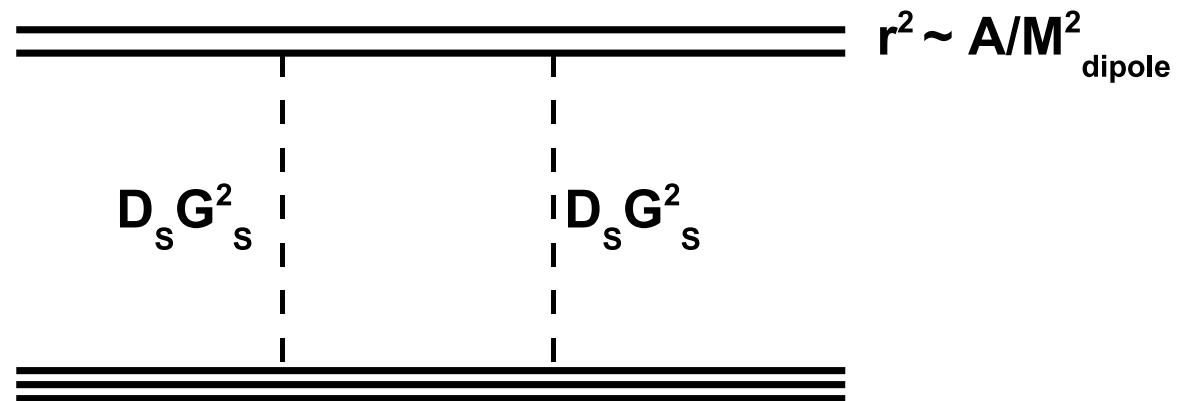
$$\frac{d\sigma}{dt} = \frac{1}{4\pi} \left| \frac{G_N^4 D_{0N}^2 \mu_N^2}{98\pi} \exp\left(-\frac{|t|}{2\mu_N^2}\right) \right|^2 \Leftrightarrow \frac{1}{4\pi} |3\beta F_1(t)|^4 s^{2\alpha_P(t)-2}$$

- ... Gives

$$G_N^4 D_N^2 = 8\beta^2 s^{2\alpha_P(0)-2} (4b + 2\alpha' \log(s)) \mu_N^2$$

$$\mu_N^{-2} = 4b + 2\alpha' \log(s)$$

SEMI-HARD COLOR EXCHANGE



- The Dipole- p Amplitude from Elastic VM production (\sim BFKL + Saturation)

$$T = 2\pi R_p^2 N_0 (P_S)^{(1-\gamma_a)} \exp\left(-\frac{\log^2(P_S)}{2\kappa\lambda Y}\right) \exp(-B|t|)$$

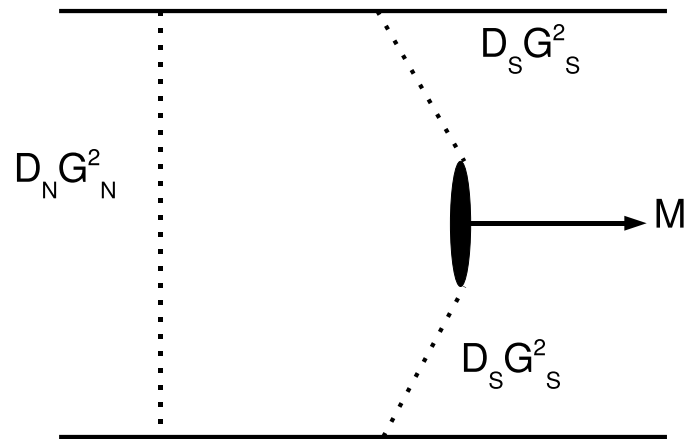
$$P_S = \frac{r^2 Q_S^2}{4} ; \quad Q_S^2 = Q_0^2 \exp(\lambda Y) (\propto R_S^{-2}) ; \quad r^2 \sim \frac{A}{M^2}$$

- ... Gives

$$G_S^4 D_S^2 = \text{cst.} R_p^2 Q_S^2 \times (P_S)^{-\gamma_a} \exp\left(\frac{\log^2(P_S)}{4.35 \log(\xi)}\right)$$

$$\mu_S^2 = \frac{1}{2B} ; \quad \gamma_a = .2376 \quad (\text{Marquet, Soyez, R.P., 2007})$$

HYBRID EXCLUSIVE MODEL



- Exclusive Matrix Element

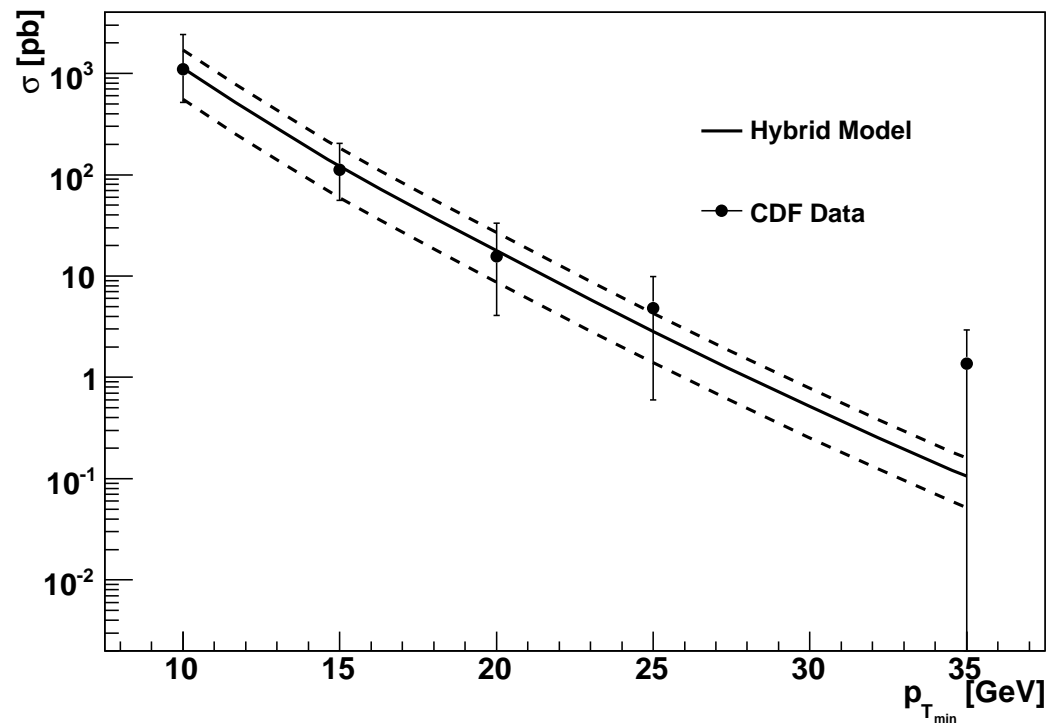
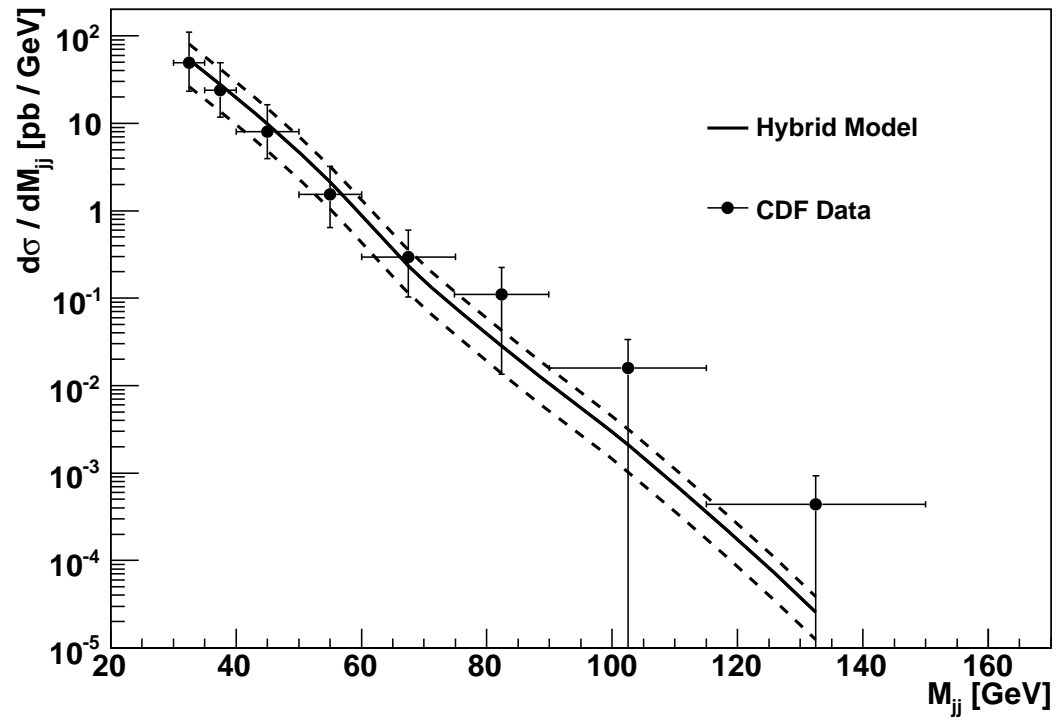
$$|M|^2 = (D_N G_N^2)^2 [D_S G_S^2]_{(1)}^2 [D_S G_S^2]_{(2)}^2 |M_{\hat{\sigma}}|^2$$

- Exclusive Cross-Section

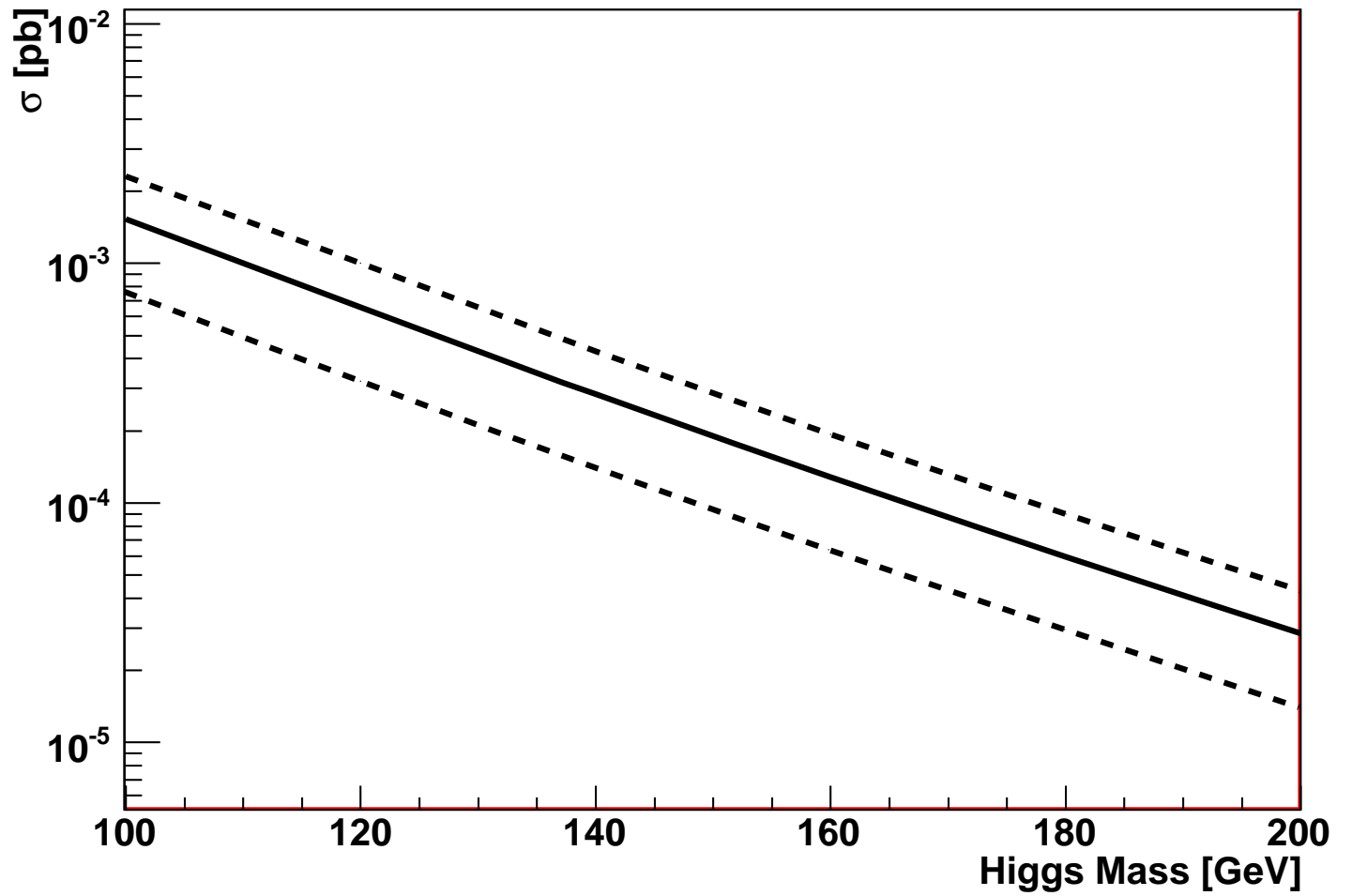
$$\sigma = \frac{2s}{(2\pi)^5} \int d^4 p_1 d^4 p_2 \delta(p_1^2) \delta(p_2^2) \delta((p_a + p_b - p_1 - p_2)^2 - M^2) |M_{\hat{\sigma}}|^2$$

- Parameters from F_2

Dijets at the Tevatron



Higgs Boson at the LHC



Conclusions and prospects

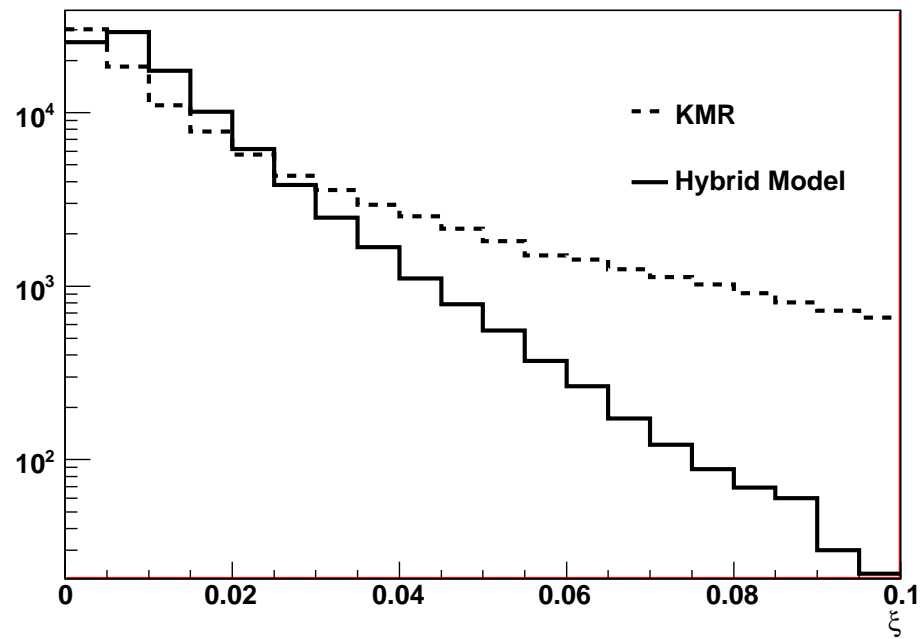
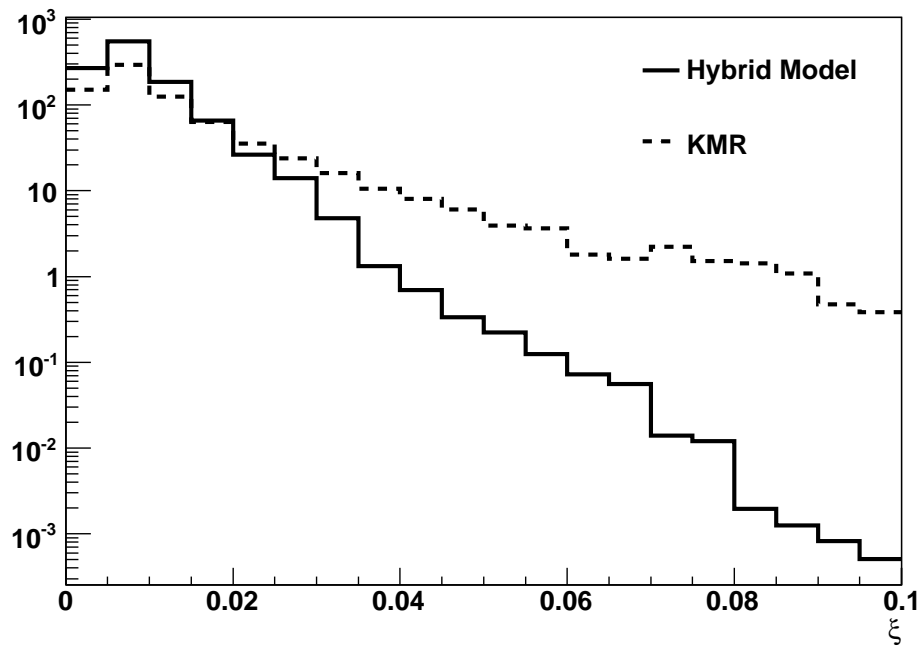
In conclusion:

- Hybrid Pomeron Model for Exclusive Production
Two Time Scales: $\sqrt{\text{Hard}} + \sqrt{\text{Soft}}$ Pomerons
- Hard Pomeron
Contains implicit (\sim Sudakov?) form factor
- Results for Dijets at the Tevatron
Spectra in agreement with data
- Predictions for the Higgs Boson at the LHC
Similar than KMR, except ξ distribution
- Parameter Dependence
Small

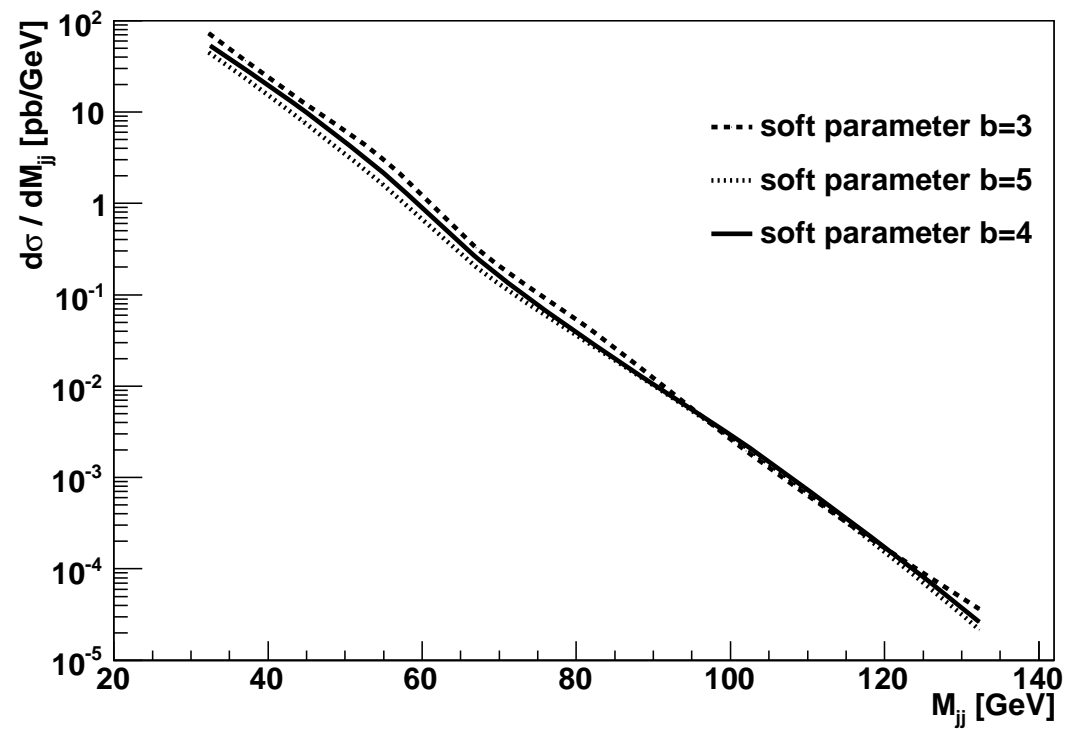
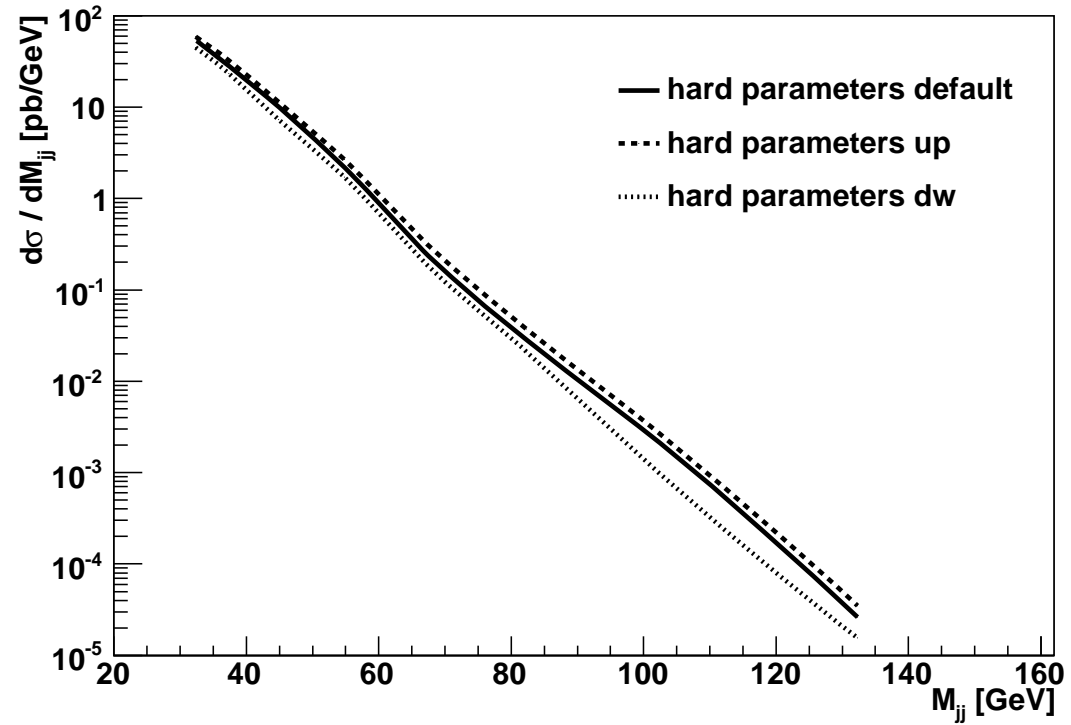
In outlook:

- Comparison/Unification of Pomeron models
Connection with KMR and SCI models
- Unified Description of hard diffractive phenomena
Towards a new approach to the Pomeron problem

Hybrid *vs.* KMR (ξ distr.)



Parameter Dependence (m_{jj})



Parameter Dependence (P_t^{min})

