

# Hybrid Model of Hard Central Diffraction

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- Motivation(s)

*A two-time-scale process*

- Formulation

*“Hybridation” of the B-L Approach*

- Results (preliminary)

*Massplots and Rapidity spectra*

- Conclusions

*The anomalous dimension of the Pomeron Flux*

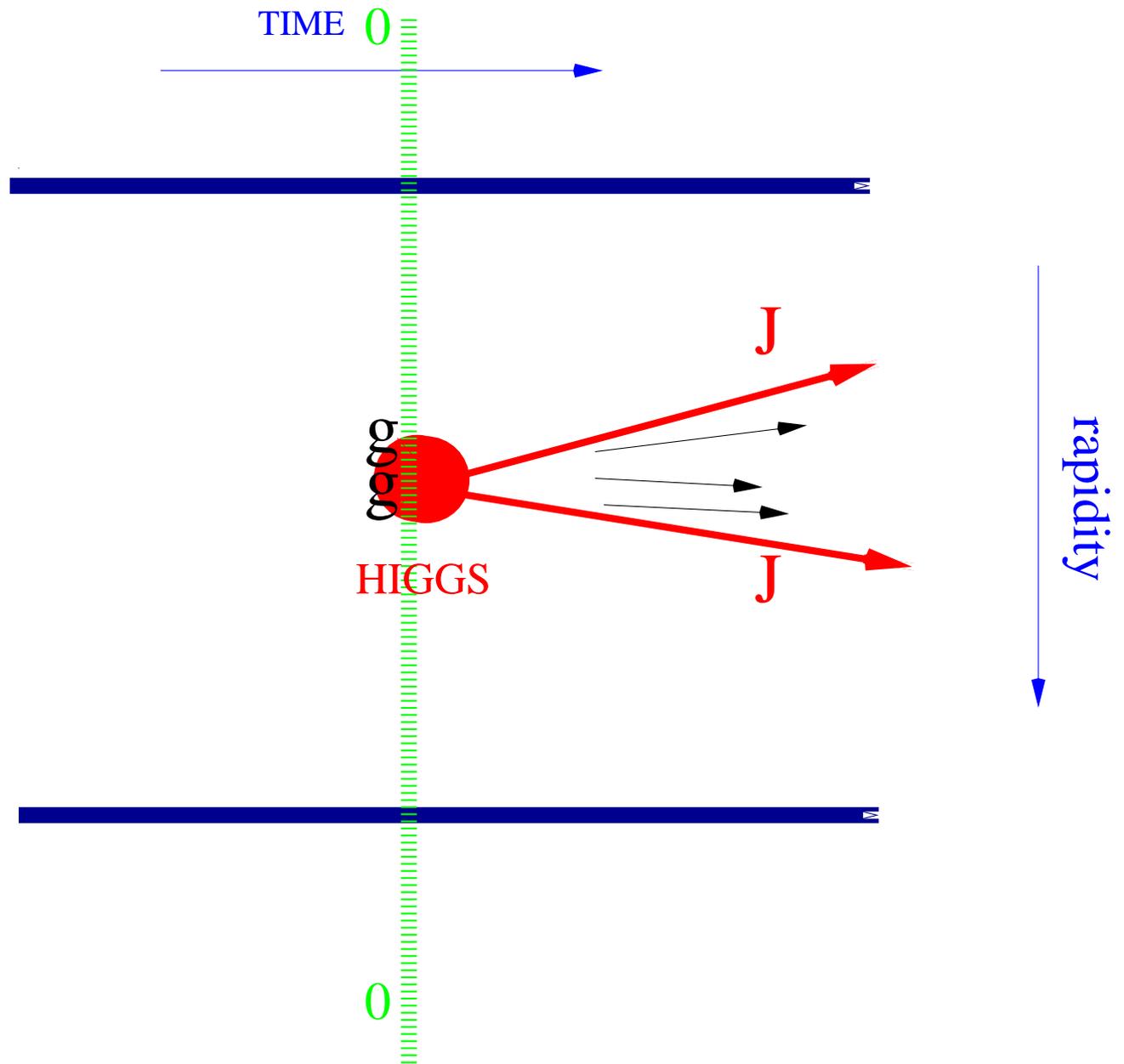
- Prospects

*Unifying models of Exclusive and Inclusive Production*

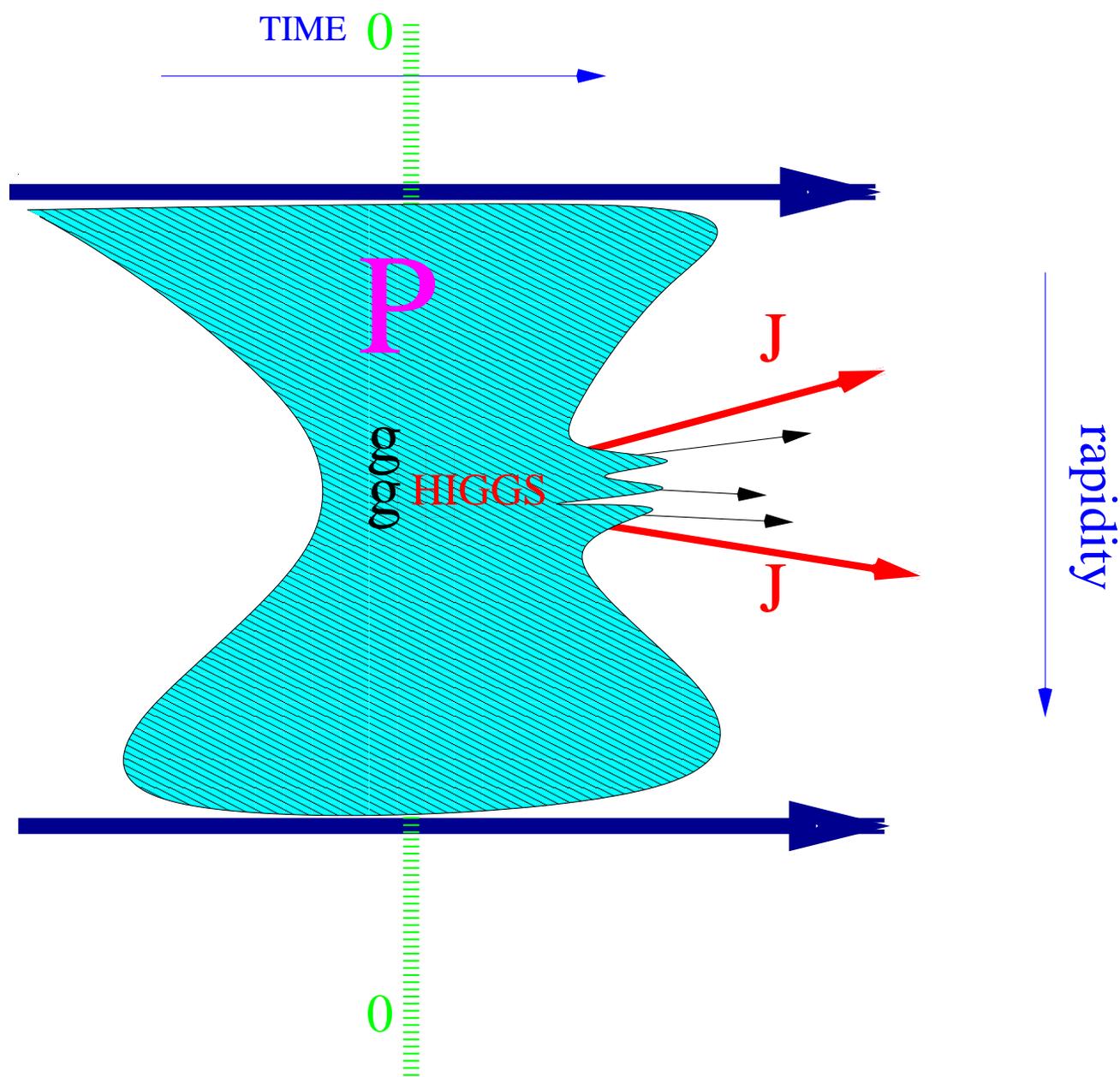
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<sup>a</sup>with Murilo Rangel (Rio de Janeiro, CBPF), in progress

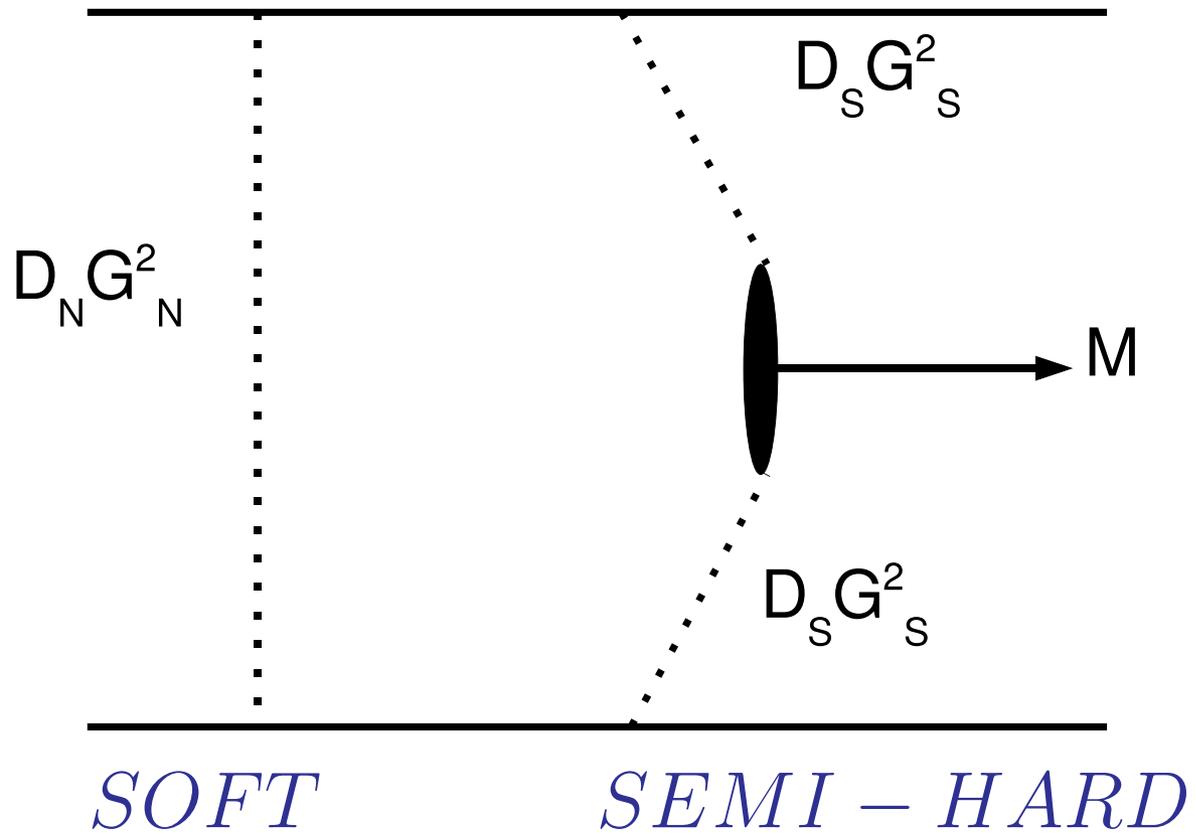
# Hard central Diffraction:



# A two-time-scale process



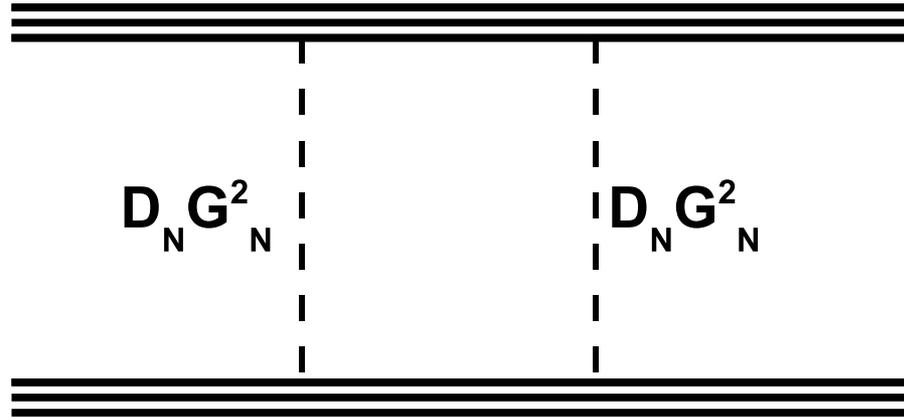
# The “Hybrid” Skeleton



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

# SOFT EXCHANGE

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



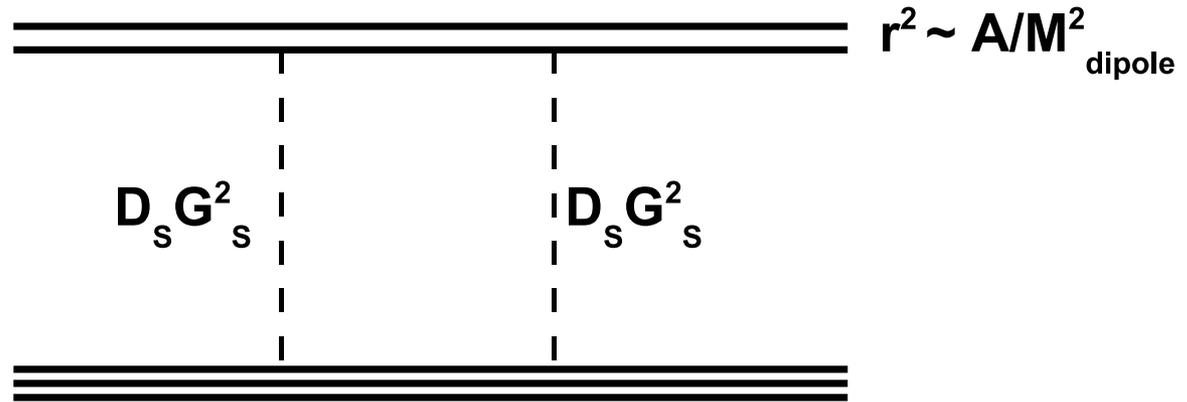
$$\frac{d\sigma}{dt} = \frac{1}{4\pi} \left| \frac{G_N^4 D_{0N}^2 \mu_N^2}{98\pi} \exp\left(-\frac{|t|}{2\mu_N^2}\right) \right|^2 \Leftrightarrow \frac{1}{4\pi} |3\beta F_1(t)|^4 s^{2\alpha_P(t)-2}$$

- ... 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 EXCHANGE



- Simple Dipole- $p$  Amplitude ( $\sim$  Color transparency)  
if anomalous dimension  $\gamma_a = 0$

$$T \rightarrow \sigma_0 \frac{r^{2(1-\gamma_a)}}{4R_S^2} \exp(-B|t|)$$

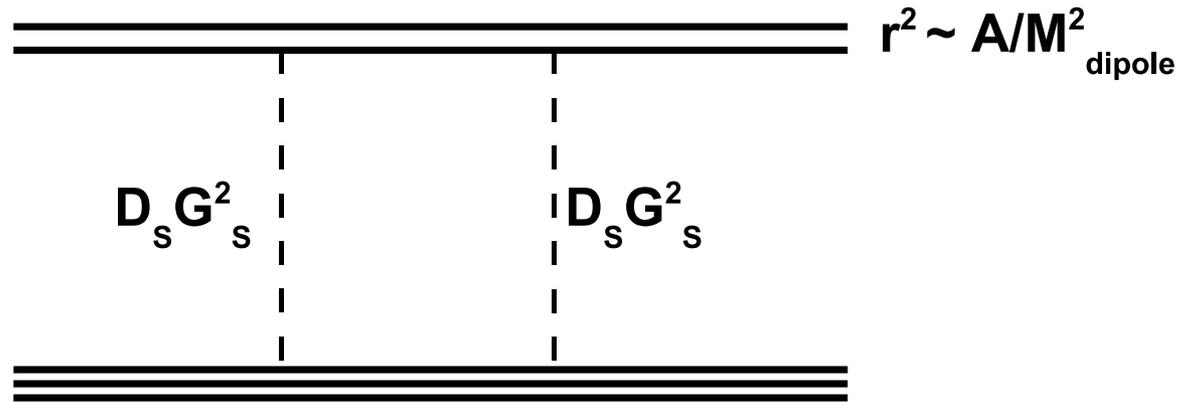
$$R_S^2 = \left(\frac{x}{x_0}\right)^\lambda; \quad r^2 \sim \frac{A}{M^2}$$

- ... Gives

$$G_S^4 D_S^2 = \text{cst.} \times r^{2-\gamma_a} \exp(\lambda Y)$$

$$\mu_S^2 = \frac{1}{2B}$$

## SEMI-HARD EXCHANGE (2)



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

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

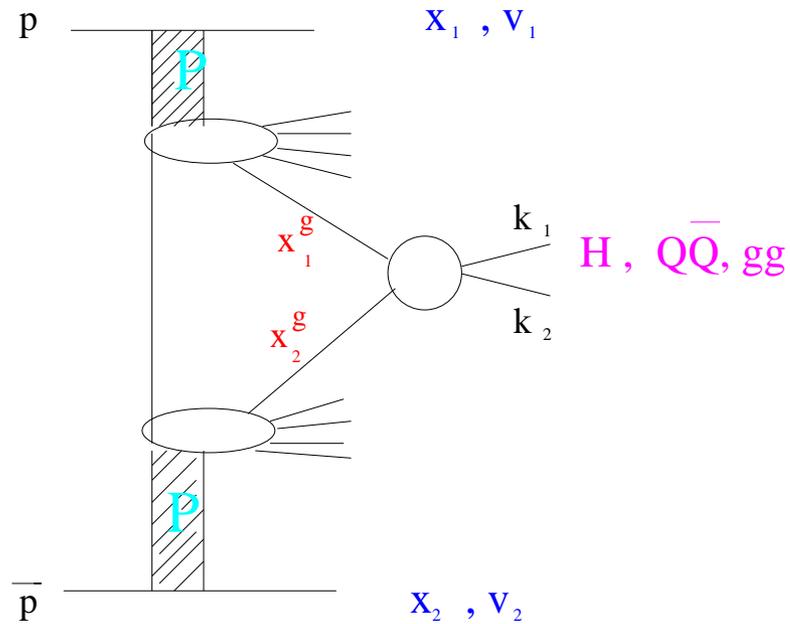
$$P_S = \frac{r^2 Q_S^2}{4} ; Q_S^2 = Q_0^2 \exp(\lambda Y) (\propto R_S^{-2}) ; r^2 \sim \frac{A}{M^2}$$

- ... Gives

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

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

# HYBRID DPEMC MODEL



- Pomeron Flux

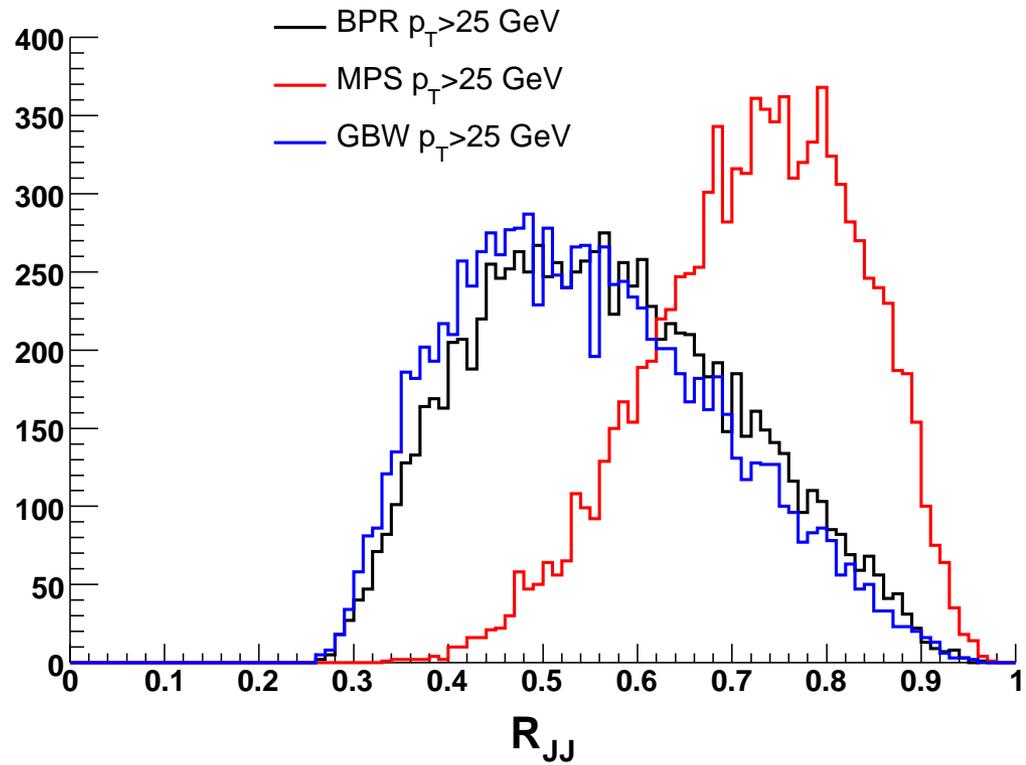
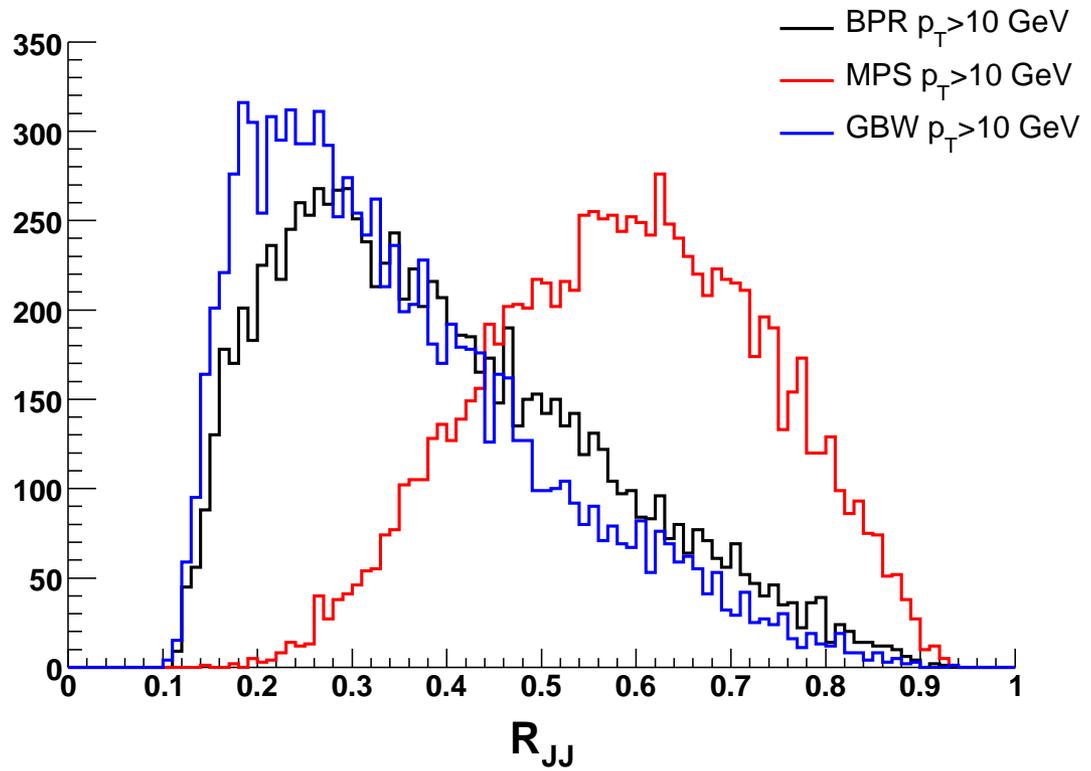
$$|M|^2 = (D_N G_N^2)^2 [D_S G_S^2]_{(1)}^2 [D_S G_S^2]_{(2)}^2 |M_{\hat{\sigma}}|^2 [F(|t_1|)F(|t_2|)]^2$$

- DPEMC Cross-Section

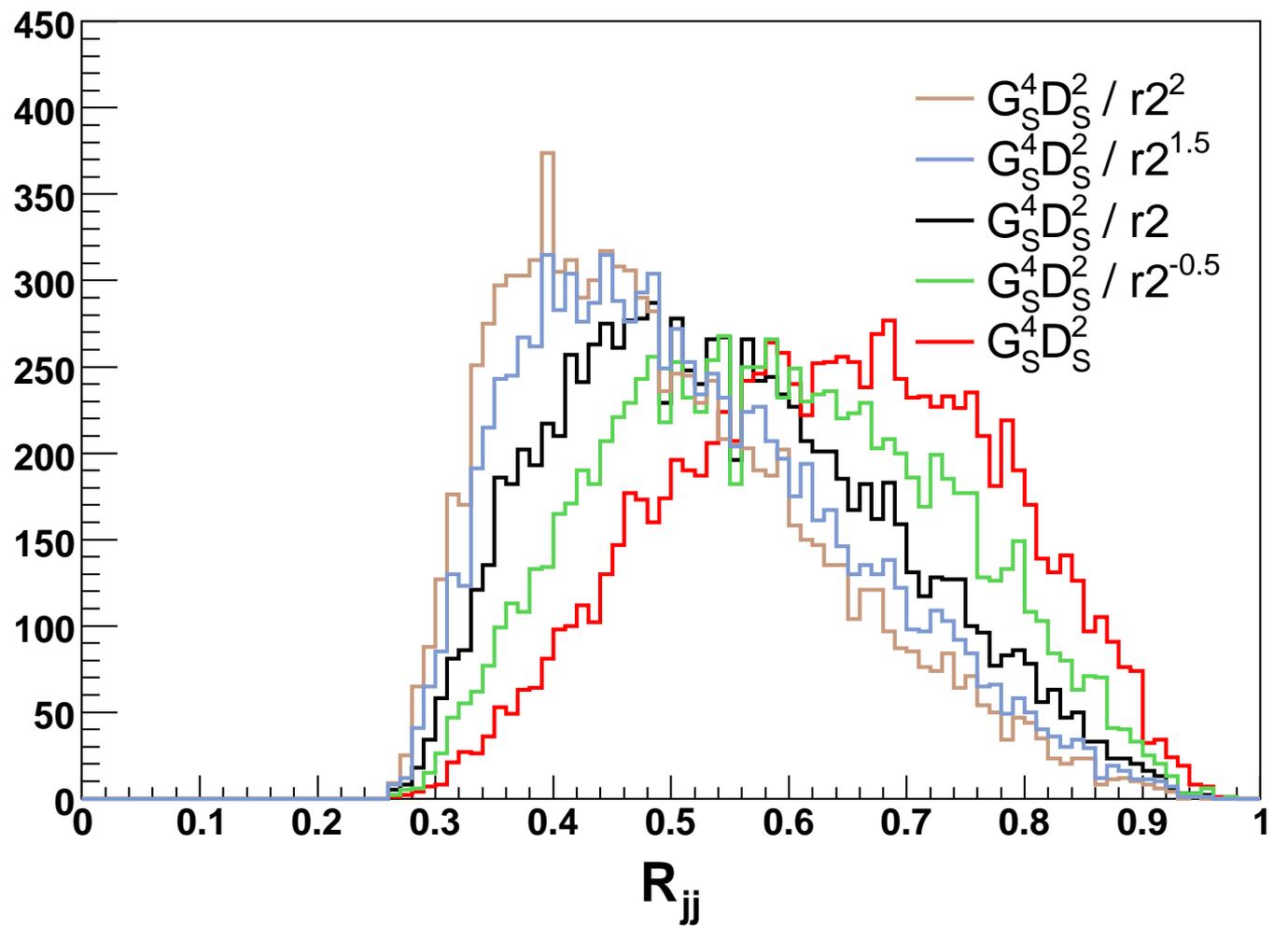
$$\sigma = \{Pomeron Flux\} \otimes \{Pomeron structure Functions\} \otimes \{Matrix Element\}$$

- Pomeron structure Functions from Hard Diffraction

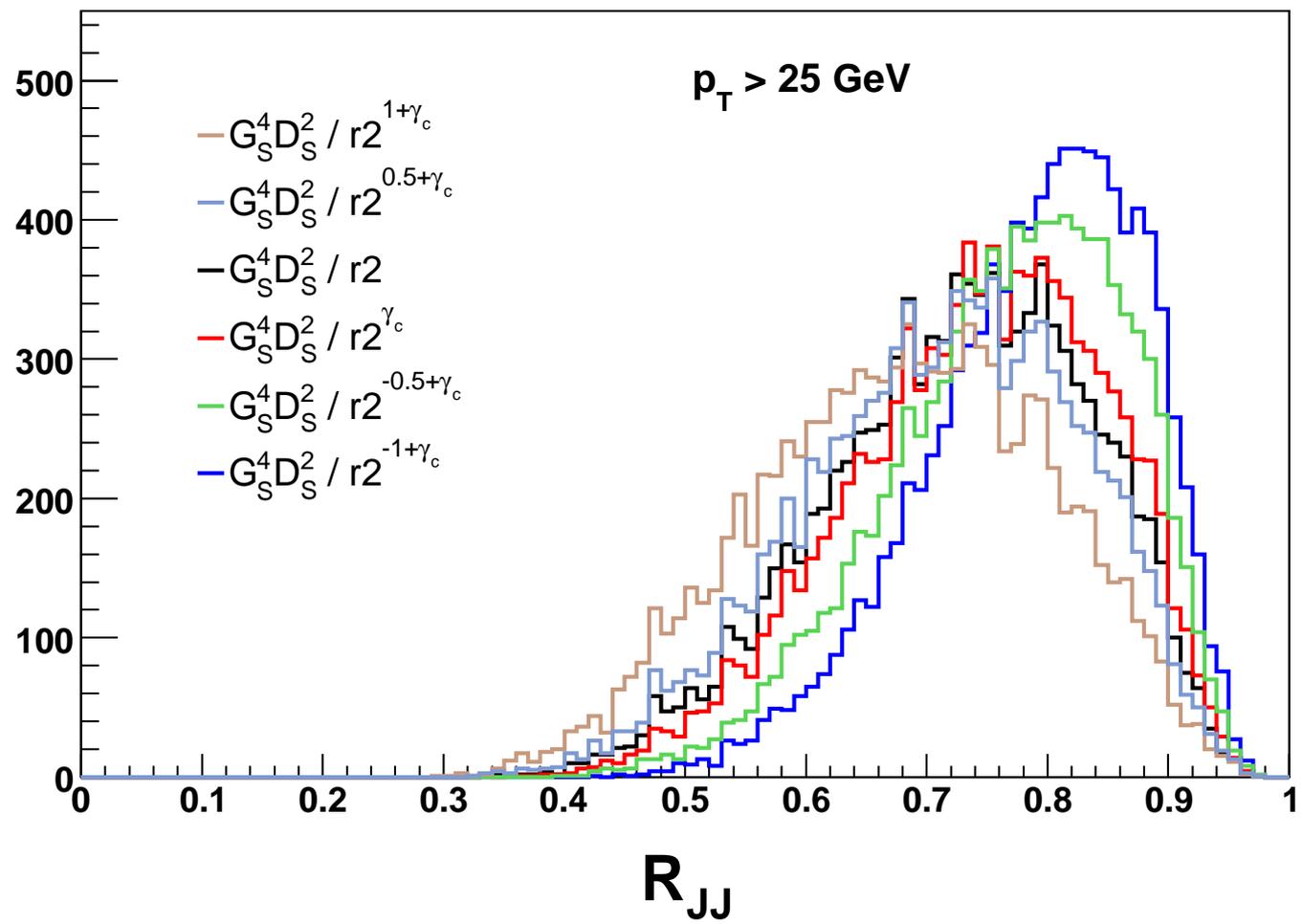
# Massplots (1)



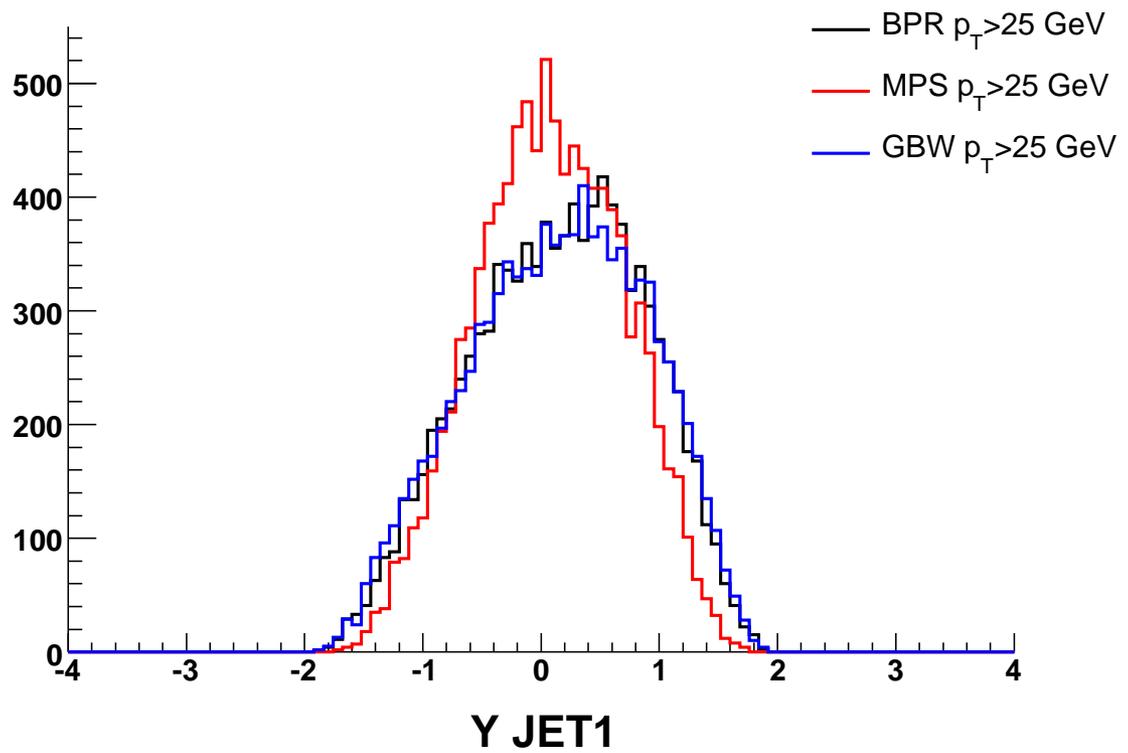
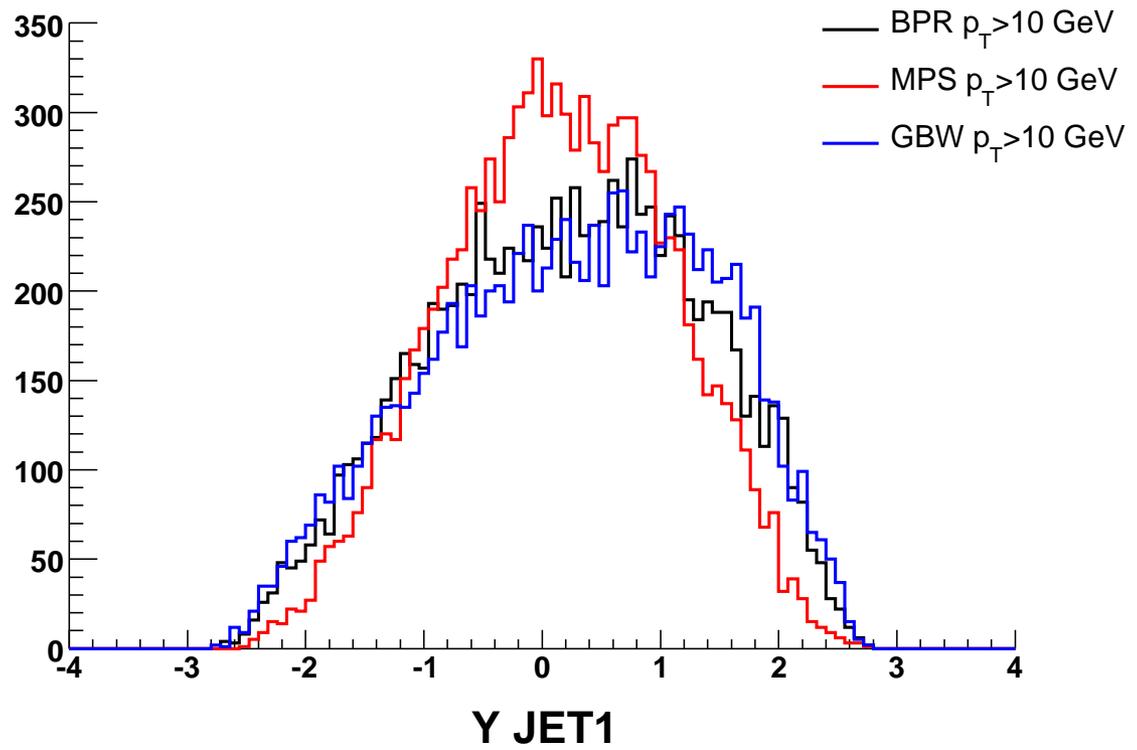
## Massplots (2)



# Massplots (3)



# Rapidity spectrum



# Conclusions and prospects

In conclusion:

- **Hybrid Model**  
Attempt for 2 time scales
- **Pomeron Flux**  
Its anomalous dimension modifies the spectrum

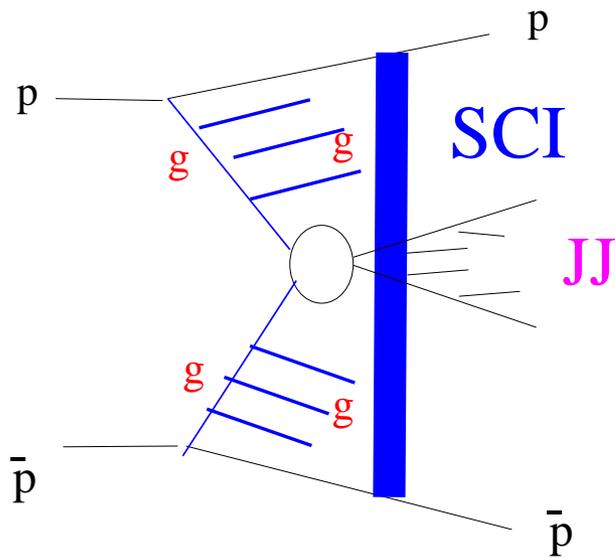
In progress:

- **Use of Pomeron Structure Functions**  
Matching with Hard diffraction
- **Exclusive/Inclusive Central Diffraction**  
Evaluation of Normalizations

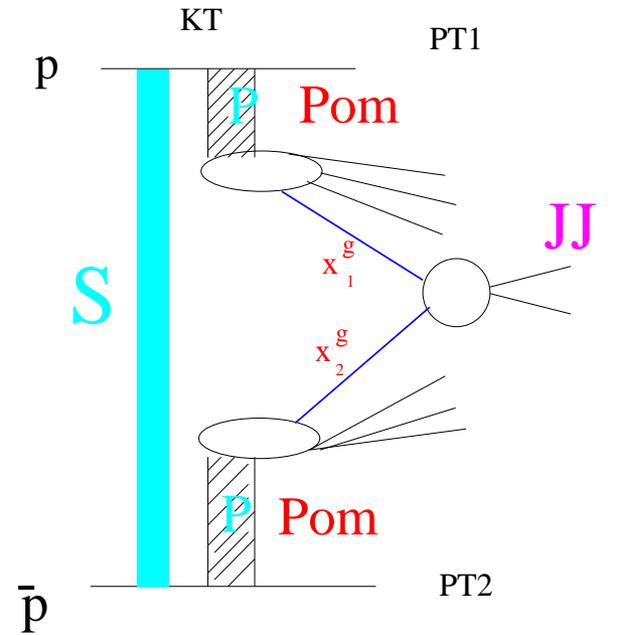
In outlook:

- **Comparison/Unification of pomeron models**  
Is there a connection with the SCI model?
- **Unified Description of hard diffraction phenomena**  
A new approach to the Pomeron problem?

# Comparisons with SCI



SOFT COLOR INTERACTION



POMERON MODEL