About me

- Education: Faculty of Physics, department of General and Theoretical Physics, *Samara State University* (Samara, Russia): **2007 – 2012**
- PhD in SSU: "*Hard processes in the Parton Reggeization Approach*", defended in BLTP (Dubna) in **2016**. Thesis adviser: Prof. *Vladimir A. Saleev*
- Postdocs:
  1. **2018 – 2020**: *A. von Humboldt fellow* in Uni. Hamburg (Germany) in the group of Prof. *Bernd A. Kniehl*
  2. **2022**: Postdoctoral position in the NCBJ (National Center for Nuclear Research) in Warsaw, Poland in the group of *Jakub Wagner*
  3. **2023 – 2024**: *Marie Skłodowska-Curie fellow* in IJClab in the group of *Jean-Philippe Lansberg*.

My previous activity

- During the PhD thesis: Development of "*Parton Reggeization Approach (PRA)*" at LO in α_s. PRA=(GI amplitudes with off-shell "Reggeized" incoming partons from Lipatov's EFT) + (KMRW formula for the unintegrated PDFs). Processes:
  - Quarkonium hadro-production
  - Dijet production, $\Delta\phi$ de-correlations
  - Photon+jet photoproduction at HERA, including $\gamma + R(\mathbf{q}_T) \to \gamma + g$ one-loop "quark-box" subprocess
  - Diphoton hadroproduction at the LHC in the incomplete-NLO approximation of PRA and including $R(\mathbf{q}_{T1}) + R(\mathbf{q}_{T2}) \to \gamma + \gamma$ one-loop "quark-box" subprocess
- During my postdoc in Hamburg:
  - Double J/ψ hadroproduction in the LO of PRA including BFKL resummation effects at $\Delta Y \gg 1$, together with *Zhi-Guo He*
  - One-loop corrections to the scattering vertices with two scales in Lipatov's EFT: $\gamma^*(Q^2) + Q(\mathbf{q}_T) \to q$, $H^*(Q^2) + R(\mathbf{q}_T) \to g$
  - Complete NLO computation for Higgs-DIS ($H^*(Q^2) + p \to X$) in PRA and an attempt to resolve its perturbative instability
- During my postdoc in Warsaw:
  - **Matching calculation** between LL HEF and NLO of CF for $\sigma(\sqrt{s_{pp}})$ of $p + p \to \eta_c + X$
  - **Matching calculation** between LL HEF and NLO of CF for $\sigma(\sqrt{s_{\gamma p}})$ of $\gamma + p \to J/\psi + X$
  - Continuation of develpment of HEF at NLL
  - Full NLO CF computation for $\gamma + p \to J/\psi + X$ is reproduced using Catani-Seymour dipole subtraction method

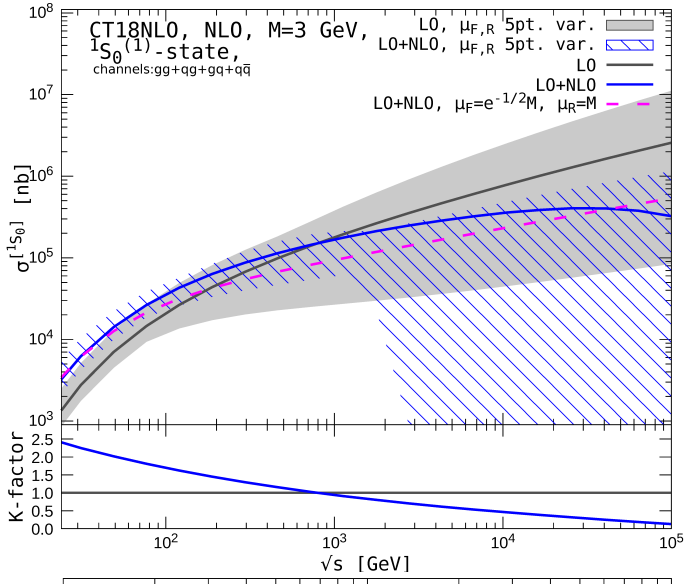
Perturbative instability of quarkonium total cross sections

Inclusive η_c-hadroproduction (CSM):

$$p+p \to c\bar{c}\left[{}^1S_0^{[1]}\right]+X,\ \text{LO: } g(p_1)+g(p_2) \to c\bar{c}\left[{}^1S_0^{[1]}\right],$$

$$\sigma(\sqrt{s_{pp}}) = f_i(x_1,\mu_F) \otimes f_j(x_2,\mu_F) \otimes \hat{\sigma}(z),$$

where $z = \frac{M^2}{\hat{s}}$ with $\hat{s} = (p_1+p_2)^2$.

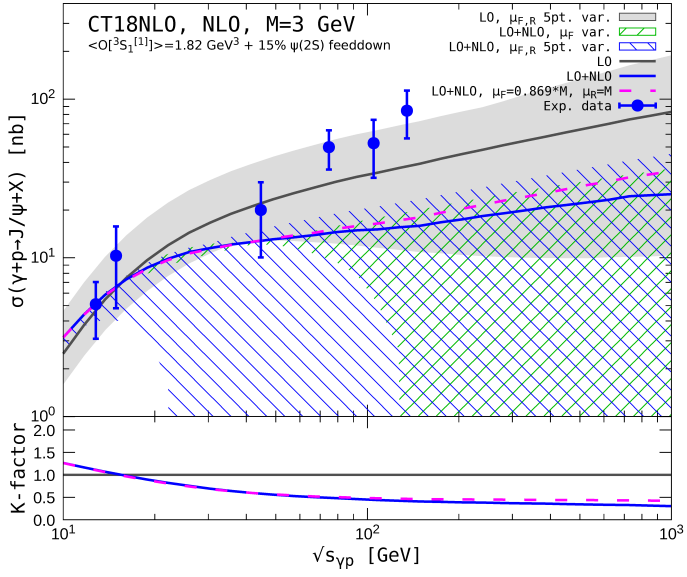


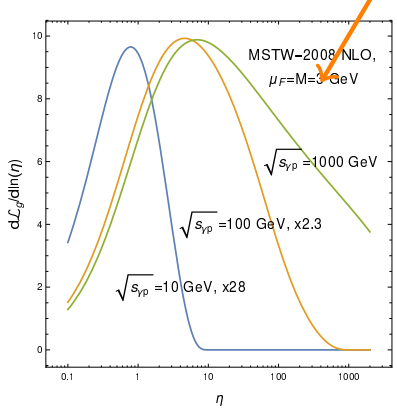
Inclusive J/ψ-photoproduction (CSM):

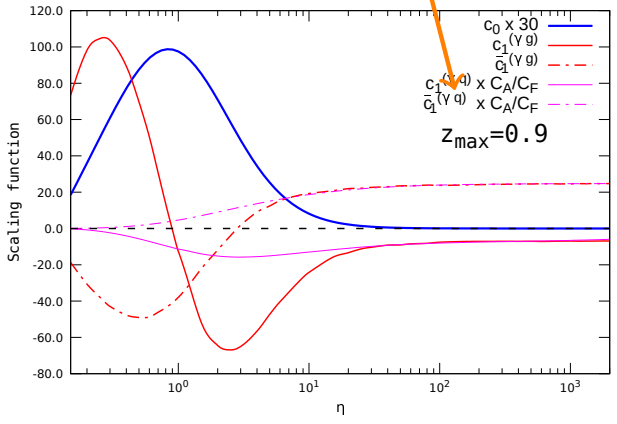
$$\gamma+p \to c\bar{c}\left[{}^3S_1^{[1]}\right]+X,\ \text{LO: } \gamma(q)+g(p_1) \to c\bar{c}\left[{}^3S_1^{[1]}\right]+g,$$

$$\sigma(\sqrt{s_{\gamma p}}) = f_i(x_1,\mu_F) \otimes \hat{\sigma}(\eta),$$

where $\eta = \frac{\hat{s}-M^2}{M^2}$ with $\hat{s} = (q+p_1)^2$.



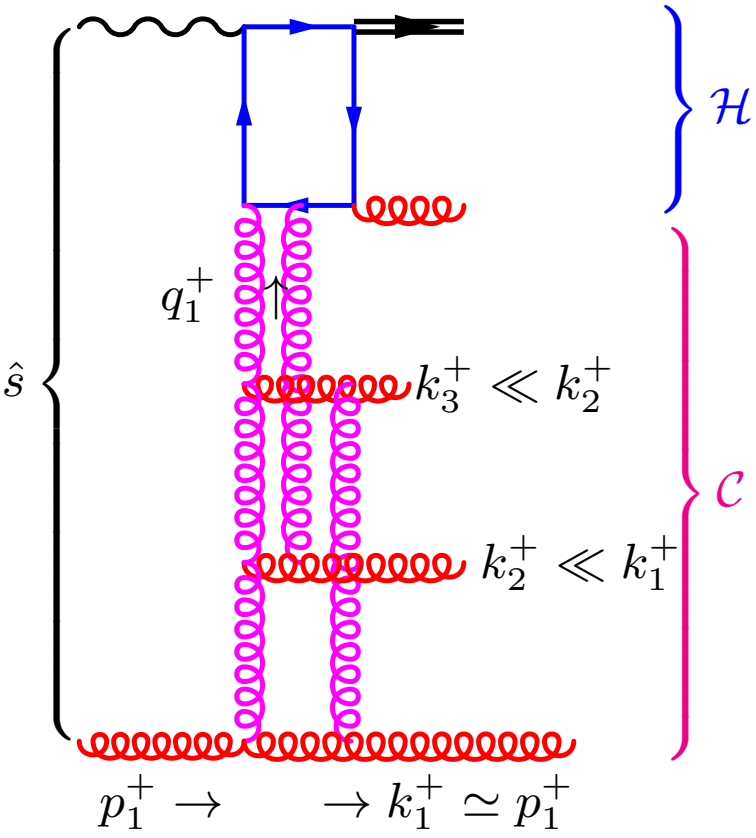




High-Energy Factorization

The **LLA** ($\sum_n \alpha_s^n \ln^{n-1}(1+\eta)$) formalism is due to [Collins, Ellis, 91'; Catani, Ciafaloni, Hautmann, 91',94']

Physical picture in the **LLA** for photoproduction:



Glauber exchanges($k_+ k_- \ll \mathbf{k}_T^2$) form the **Reggeized gluon** in the t-channel.

$$\hat{\sigma}_{\rm HEF}(\eta) \propto \int_0^{1+\eta} \frac{dy}{y} \int_0^{\infty} d\mathbf{q}_{T1}^2 \mathcal{C}\left(\frac{y}{1+\eta}, \mathbf{q}_{T1}^2, \mu_F, \mu_R\right) \times \mathcal{H}(y, \mathbf{q}_{T1}^2) + \text{NLLA} + O(1/\eta).$$

- The resummation factor $\mathcal{C}$ is the solution of the LL **BFKL** equation with collinear divergences subtracted,
- The coefficient function $\mathcal{H}$ can be calculated at LO and NLO (needed for **NLLA**),
- For consistency with fixed-order **DGLAP** evolution the anomalous dimension γ_{gg} in $\mathcal{C}$ should be truncated:

$$\gamma_{gg}(N, \alpha_s) = \underbrace{\underbrace{\frac{\hat{\alpha}_s}{N}}_{\text{DLA}} + 2\zeta(3)\frac{\hat{\alpha}_s^4}{N^4} + 2\zeta(5)\frac{\hat{\alpha}_s^6}{N^6} + \ldots}_{\text{LLA}}$$

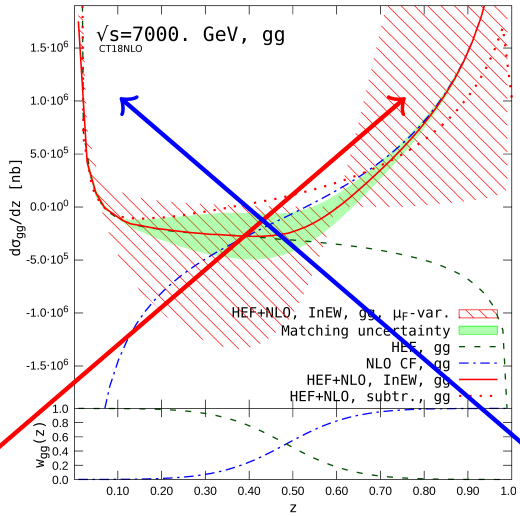
- Expansion of $\hat{\sigma}_{\rm HEF}(\eta)$ in α_s **correctly reproduces** $\hat{\sigma}_{\rm NLO}(\eta \gg 1)$ and predicts the $\hat{\sigma}_{\rm NNLO}(\eta \gg 1)$.

Matching with NLO

The HEF is valid in the **leading-power** in $M^2/\hat{s}$, so for $\hat{s} \sim M^2$ we match it with NLO CF by the *Inverse-Error Weighting Method* [Echevarria, *et.al.*, 2018].

η_c-hadroproduction,

$z = M^2/\hat{s}$:



NLO **HEF**

J/ψ-photoproduction,

$\eta = (\hat{s} - M^2)/M^2$: