On the impact of J/ψ ALL measurements

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PDFs in a form of replicas

- Knowledge on PDFs is represented in set of replicas (see e.g. arxiv:1012.0836), instead of parameterization and uncertainties of parameters. It allows to easily estimate averages and uncertainties. In this case

$$\langle \mathcal{O} \rangle = \int \mathcal{O}[f]\, \mathcal{P}(f)\, Df = \frac{1}{N} \sum_{k=1}^{N} \mathcal{O}[f_k]$$

- Impact of the new data can easily estimated by the Bayesian reweighting procedure

$$\langle \mathcal{O} \rangle_{\text{new}} = \int \mathcal{O}[f]\, \mathcal{P}_{\text{new}}(f)\, Df = \frac{1}{N} \sum_{k=1}^{N} w_k \mathcal{O}[f_k]$$

$$w_k = \frac{(\chi^2_k)^{\frac{1}{2}(n-1)} e^{-\frac{1}{2}\chi^2_k}}{\frac{1}{N}\sum_{k=1}^{N} (\chi^2_k)^{\frac{1}{2}(n-1)} e^{-\frac{1}{2}\chi^2_k}}$$

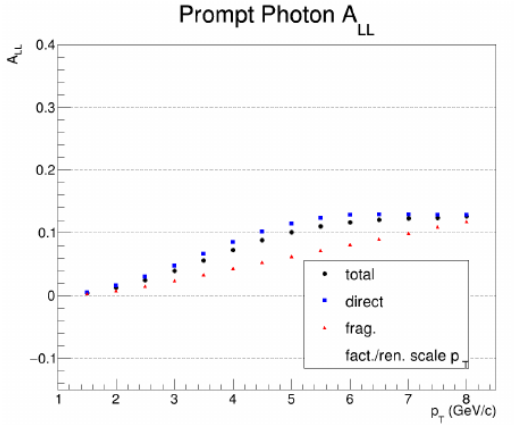
$$\mathcal{P}(\chi|f) \propto (\chi^2(y,f))^{\frac{1}{2}(n-1)} e^{-\frac{1}{2}\chi^2(y,f)}$$

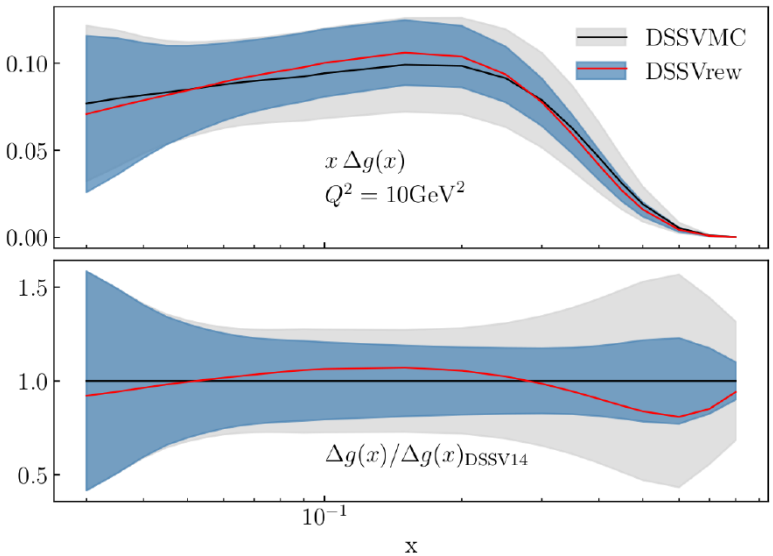
$$\mathcal{P}_{\text{new}}(f) = \mathcal{N}_\chi \mathcal{P}(\chi|f)\, \mathcal{P}_{\text{old}}(f)$$

$$\begin{aligned} \langle \mathcal{O} \rangle_{\text{new}} &= \int \mathcal{O}[f]\, \mathcal{P}_{\text{new}}(f)\, Df, \\ &= \mathcal{N}_\chi \int \mathcal{O}[f]\, \mathcal{P}(\chi|f) \mathcal{P}_{\text{old}}(f)\, Df, \\ &= \frac{1}{N} \sum_{k=1}^{N} \mathcal{N}_\chi \mathcal{P}(\chi|f_k) \mathcal{O}[f_k]\,, \end{aligned}$$

PDFs in a form of replicas

- Generate pseudodata →
- assign errors expected to our measurements →
- weight replicas using predictions for them →
- get new uncertainties for PDFs.

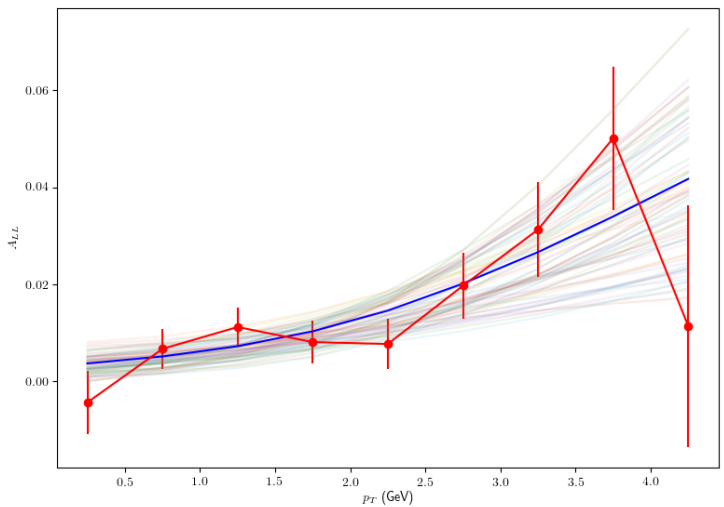


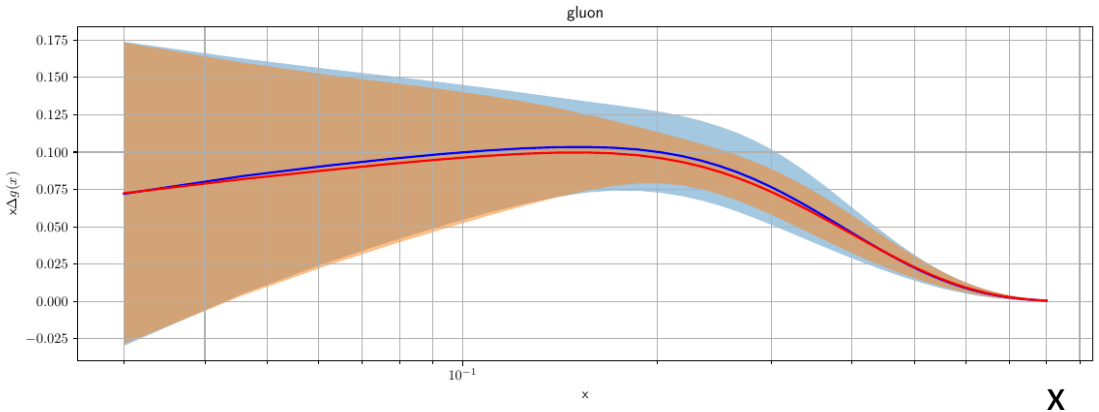


Courtesy: Sassot, Borsa, 2021, from A. Datta at NUCLEUS 2021.
Calculated with **1000 DSSV14 replicas**.

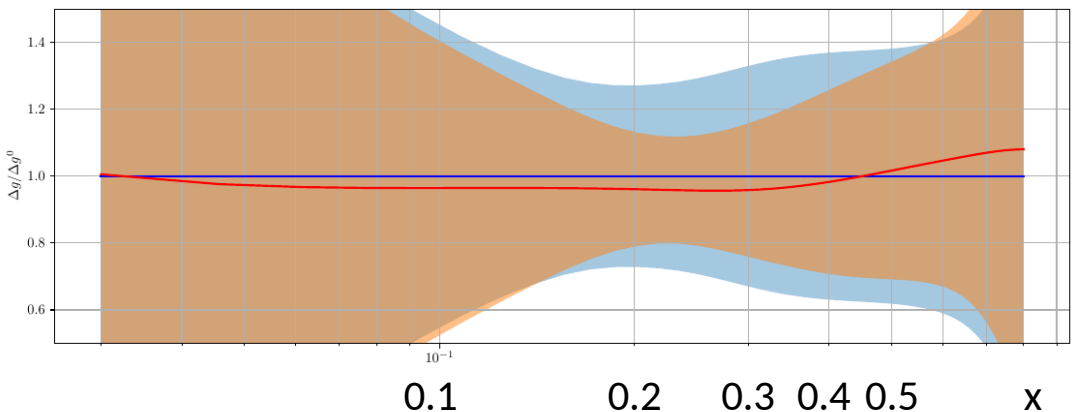
Impact of SPD J/ψ ALL measurements (very preliminary)

- PDF set: NNPDFpol1.1 (100 replicas)
- DSSV set of replicas is also available, but it consists of 1000 replicas
- Pseudodata: average smeared with errors obtained for CDR





x



Summary

- **Very preliminary** results on the impact of … have been obtained for NNPDFpol1.1.
- There are also DSSV14 replicas, but their number is 10 times larger. Is it feasible to make prediction for each replica.
- For $0.2 < x < 0.4$ a decrease of relative errors by a factor of **about 2** is predicted from measuring ALL pT dependence. These is comparable with results for prompt photons.
- Is the ALL pT dependence the most sensitive observable? Similar study with xF dependence would be also interesting.
- As a grain of salt, there are some very small inconsistencies with NNPDFpol1.1, I am trying to clarify that communicating with authors.

Thank you!