Status and prospects of nuclear PDFs at the LHC

Link

Overall LoI structure

- Status
  - nPDFs (focusing on most recent) from **several** groups–two new determinations since the HL(HE)-LHC YR
- Experimental advancements
  - Relying on HL(HE)-LHC YR
    - Since then, demonstrations of constraints (e.g, dijet) and verification of challenging measurements (e.g., $t\bar{t}$)
- Theoretical advancements and considerations
  - Mainly true for free-nucleon PDFs
  - To be reviewed
- Complementarity/universality with EIC
  - Should be covered in **EF06**
  - Cross reference

Nuclear (most recent) PDFs	nCTEQ15	EPPS16	nNNPDF2.0 (1.0)	TUJU19
Perturbative order	NLO	NLO	NLO, NNLO	NLO, NNLO
Heavy quark scheme	ACOT	S-ACOT	FONLL	ZM-VFN
Value of $\alpha_s(m_Z)$	0.118	0.118	0.118	0.118
Input scale Q_0	1.30 GeV	1.30 GeV	1.00 GeV	1.69 GeV
Data points	708	1811	1467 (451)	2336
Fixed Target DIS	✓	✓	✓(w/o ν-DIS)	✓
Fixed Target DY	✓	✓		
LHC DY and W		✓	✓(✗)	
Jet and had. prod.	(π^0 only)	(π^0, LHC dijet)		
Independent PDFs	6	6	3	6
Parametrisation	simple pol.	simple pol.	neural network	simple pol.
Free parameters	16	20	256 (178)	16
Statistical treatment	Hessian	Hessian	Monte Carlo	Hessian
Tolerance	$\Delta\chi^2 = 35$	$\Delta\chi^2 = 52$	—	$\Delta\chi^2 = 50$