

LHeC conveners and steering group meeting
CERN, October 22nd 2010

**Report of the working
group on
Physics at High Parton
Densities: ep and eA**

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Paul Newman (*Birmingham*) and Anna Stasto (*Penn State*)

Status of the CDR:

- Weekly evo's among the conveners have been held.
- Positive feedback from most people contacted.
- Write-up well advanced: introduced into the SVN yesterday (thanks Paul!).
- Around 55 pages with >160 references already in.
- Substantial editing still required: **when the manuscript must be sent to referees?** Depending on this, an additional face-to-face meeting may be convenient, even required.

I.1 Physics at small x (I)

I.1.1 Unitarity and QCD:

- * Introduction (J. Bartels, NA, BC, AS) 😊
- * From DGLAP to non-linear evolution equations in QCD: saturation (NA, AS) 😊
- * Saturation in perturbative QCD (NA, AS) 😊
- * The importance of diffraction (AS) 😊
- * **The importance of nuclei (NA, BC) 😞**

I.1.2 Status following HERA data:

- * Introduction (PN) 😊
- * Deviations from fixed order linear DGLAP evolution in inclusive HERA data (S. Forte, J. Rojo, PN) 😊
- * Linear resummation schemes (S. Forte, J. Rojo, AS) 😊
- * Dipole models (AS) 😊

I.1 Physics at small x (II)

I.1.3 Low- x physics at the LHC (D. d'Enterria, C. Salgado) ☹️

I.1.4 Nuclear targets:

- * Comparing nuclear parton density functions (K. Eskola, M. Strikman, NA) 😊

- * Importance of LHeC measurements to ultra-relativistic heavy ion programs at RHIC and the LHC (U. Wiedemann, NA, BC) 😊

1.2 Prospects at the LHeC (I)

1.2.1 Strategy: decreasing x and increasing A (BC) ☹️

1.2.2 Inclusive measurements:

- * Predictions for the proton (J. Albacete) 😊
- * Testing non-linear dynamics (J. Forshaw, J. Rojo, G. Soyez, PN, AS) 😊
- * Predictions for nuclei: impact on nuclear DGLAP analyses (K. Eskola, H. Paukkunen, C. Salgado, K. Tywoniuk, NA) 😊

1.2.3 Exclusive production (PN) 😊

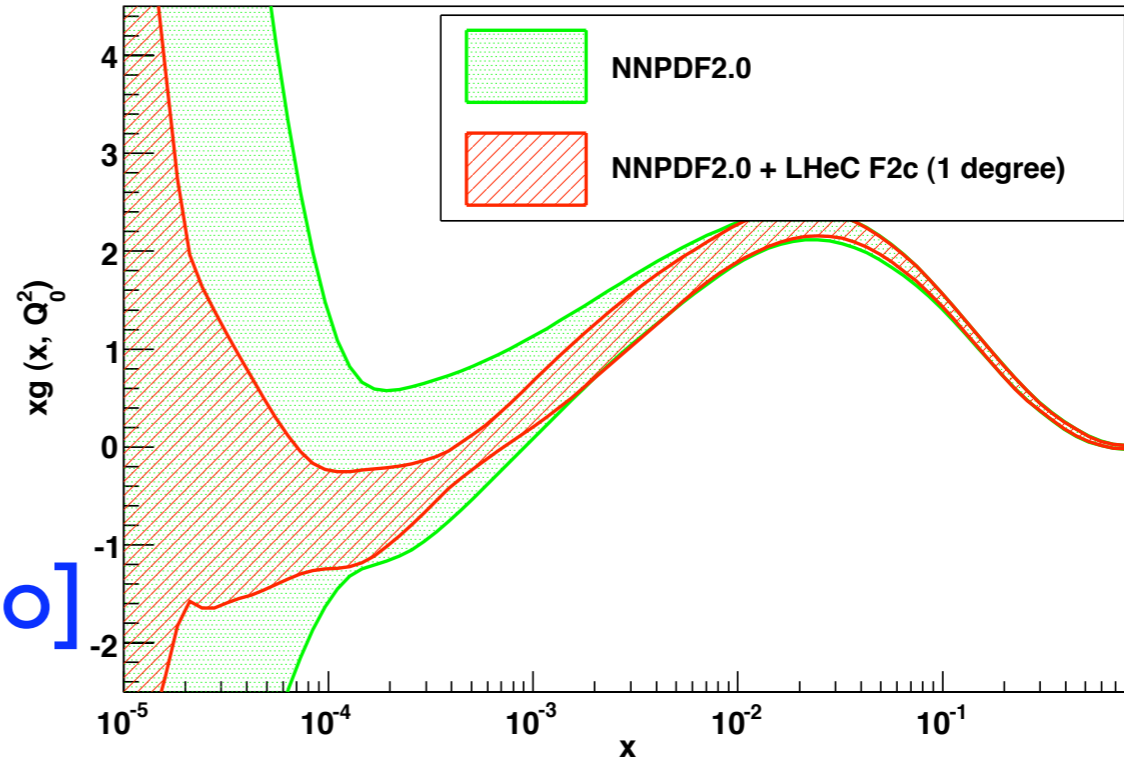
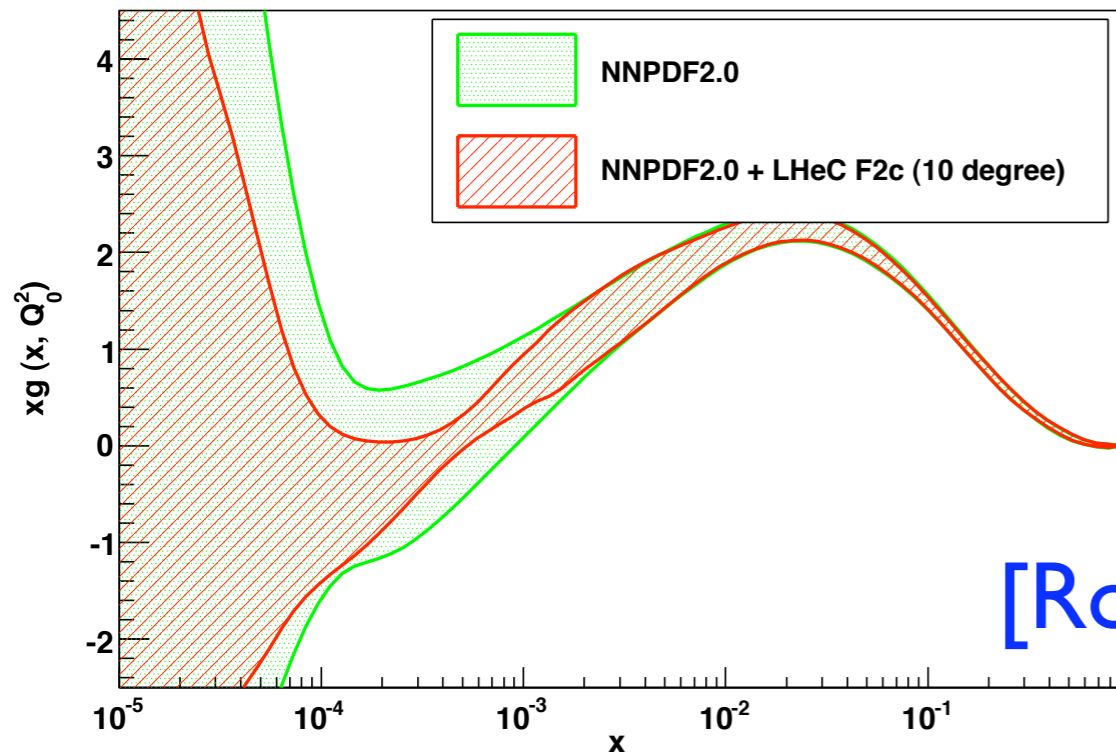
1.2.4 Exclusive vector meson production:

- * Introduction (PN) 😊
- * $\sigma(W)$ for protons (G. Watt, PN, AS) 😊
- * t -dependence (G. Watt, PN, AS) 😊
- * **Diffractional VM production from nuclei** (H. Kowalski) ☹️

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1.2.5 DVCS and GPDs (L. Favart, C. Weiss, PN, AS) ☹️

1.2.6 Inclusive diffraction:

- * Diffractive Deep Inelastic Scattering (AS, PN) 😊
- * Diffractive Parton Densities (PN) 😊
- * Diffractive DIS, Dipole Models and Sensitivity to Non-linear Effects (T. Lappi, C. Marquet, PN) 😊
- * Predicting nuclear shadowing from inclusive diffraction in ep (M. Strikman, K. Tywoniuk, NA) 😊
- * Predictions for inclusive diffraction on nuclear targets (T. Lappi, C. Marquet, AS) 😊

1.2 Prospects at the LHeC (III)

1.2.6 Jet and multi-jet observables, parton dynamics and fragmentation:

- * Forward jets, dijets, angular decorrelation (K. Kutak, H. Jung) ☹️
- * Unintegrated PDFs (J. Collins, NA, AS) 😊
- * Perturbative and non-perturbative aspects of final state radiation and hadronization (W. Brooks, BC) ☹️

1.2.7 Photoproduction Physics (new):

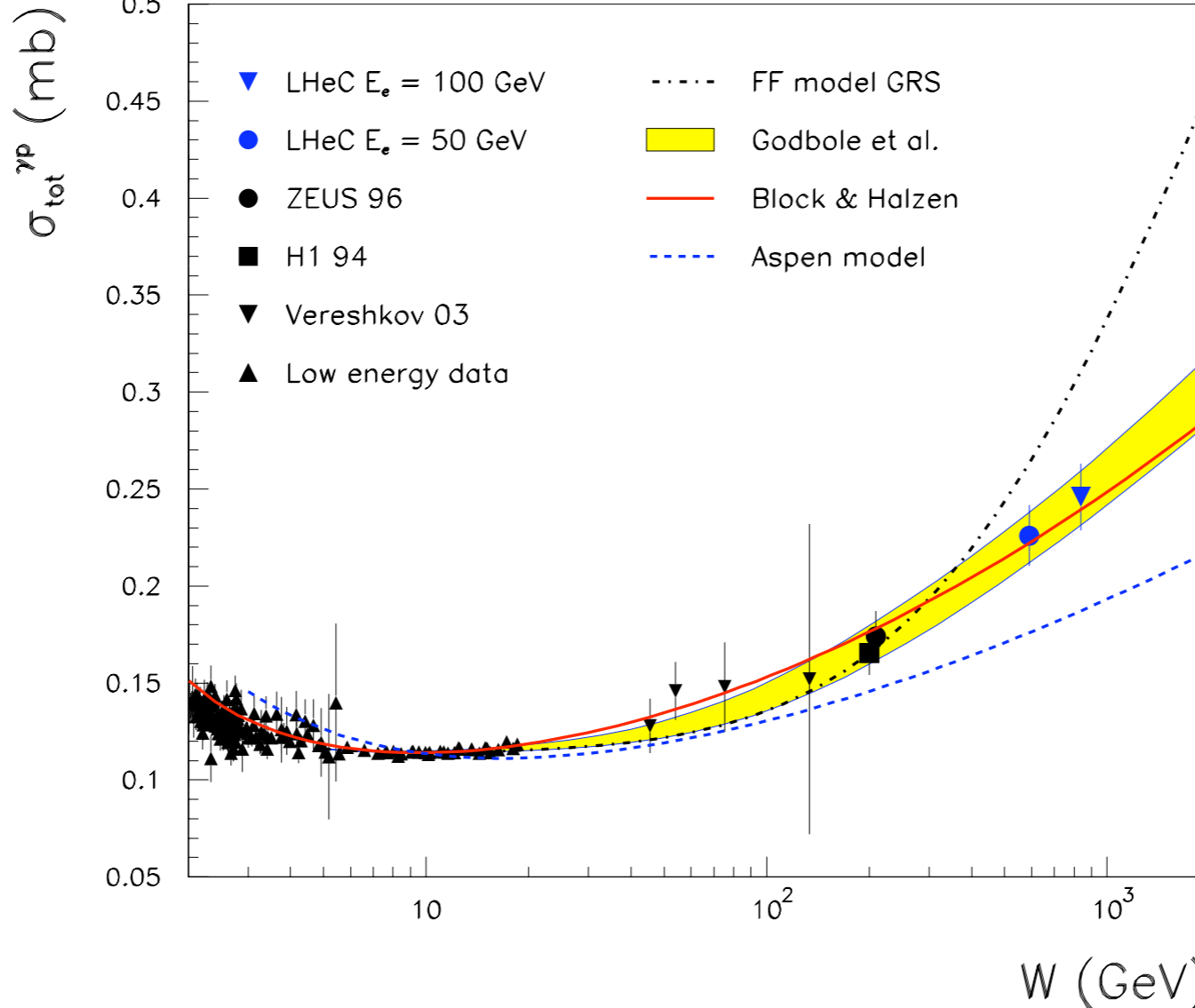
- * The total photoproduction cross section (NA, PN) 😊
- * Jet photoproduction (NA) 😊
- * Photon Structure (PN) ☹️

1.2.8 Implications for the ultra-high energy neutrino interactions (NA, AS) ☹️

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1.2.6 Jet and multi-jet observables, parton dynamics and fragmentation:

- * Forward
- Jung) ☹️
- * Unintegrated
- * Perturbative
- radiation



Kutak, H.

final state

, PN) ☺️

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- * The total
- * Jet production
- * Photoproduction

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Workshop in 12-13.11.2010:

- 7.5 hours for the sessions of the 3 Physics WGs.
- Some speakers were invited to present report on the latest additions to the CDR; the other aspects to be covered by us, aiming to a review of the different sections of our chapter.
- Our WG has 4 confirmed speakers: J. Albacete (predictions for F_2 and F_L in ep), D. d'Enterria (low-x physics @ LHC), C. Salgado (npdfs) and G. Watt (exclusive VM production in ep); **1 tbc**: H. Kowalski (exclusive VM production in eA); L. Favart and H. Jung and J. Rojo could not attend.
- **Referees to come**: M. Arneodo?, A. Mueller, R. Venugopalan?
- We would prefer to have **some time (~1.5 h) for discussion with the referees.**
- **Coordination with the other WGs**: time slots, talk duration.