

TOPICS FOR THE CERN THEORY INSTITUTE

STEFANO FORTE + FABRIZIO CAOLA

MILAN UNIVERSITY & INFN



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PARTON DISTRIBUTIONS

- NNPDF COLLABORATION \Rightarrow STAY TUNED FOR PDF4LHC
- TREATMENT OF HEAVY QUARKS THRESHOLDS:
THEORY (P. NASON) & APPLICATION TO PDF FITS (NNPDF)
- STATISTICS ISSUES \Rightarrow STAY TUNED FOR PDF4LHC

ALL-ORDER ANOMALOUS DIMENSIONS

- STANDARD FOLOKLORE: THRESHOLD RESUMMATION MAY BE RELEVANT
EVEN WHEN $s \gg M^2$ IF $\hat{s} \ll s$
EXAMPLE: GLUON PRODUCTION @ LHC BECAUSE OF SMALL x GROWTH OF GLUON
- BUT SMALL x GROWTH OF GLUON DRIVEN BY PERTURBATIVE EVOLUTION
⇒ AFFECTED BY SMALL x RESUMMATION
- IN MELLIN SPACE, $\sigma(N) = \hat{\sigma}(N)f_1(N)f_2(N)$
→ DOMINANT N REGION DRIVEN BY INTERPLAY
BETWEEN GROWTH OF f_i @ SMALL N & $\hat{\sigma}$ @ LARGE N
- IF $\sigma(N, \alpha) = \exp \int_{\alpha_0}^{\alpha} \frac{d\alpha}{\beta(\alpha)} \gamma_{\text{phys}}(N, \alpha) \sigma(N, \alpha_0)$ THEN $\gamma_{\text{phys}}(N, \alpha)$
D ETERMINED BY THE INTERPLAY OF TWO RESUMMATIONS

WHAT ARE THE MOST GENERAL CONSTRAINTS IMPOSED ON $P_{\text{phys}}(x, \alpha)$ BY ITS LARGE AND SMALL x ANALYTIC BEHAVIOURS?

CAN ONE GET FURTHER CONSTRAINTS FROM LARGE α BEHAVIUOUR (FROM ADS/CFT)?

SMALL x RESUMMATION

- FULLY MATCHED SMALL x RESUMMATION OF PERTURBATIVE EVOLUTION + HARD PARTONIC CROSS SECTIONS NOW AVAILABLE
APPLIED TO DEEP-INELASTIC SCATTERING (ALTARELLI, BALL, SF, 2008)
- RESUMMATION CORRECTIONS AT HERA AS LARGE AS NNLO, BUT OPPOSITE SIGN
- EXPECT SIMILAR EFFECTS AT LHC

CAN WE RESUM HADRONIC CROSS SECTIONS?

- HEAVY QUARK PRODUCTION (K. ELLIS AND BALL, 2001); HIGGS PRODUCTION (MARZANI, BALL, DEL DUCA, FORTE, VICINI, 2007); DRELL-YAN (MARZANI AND BALL, 2008); DIRECT PHOTON (G. DIANA, 2009)
- EFFECTS LARGE IN LESS INCLUSIVE OBSERVABLES (RAPIDITY DISTRIBUTIONS)
OR MORE SINGULAR OBSERVABLES (STERMAN-WEINBERG JETS)

CAN WE EXTEND RESUMMATION TO THESE CASES?

WHEN DOES HIGH ENERGY FACTORIZATION APPLY?