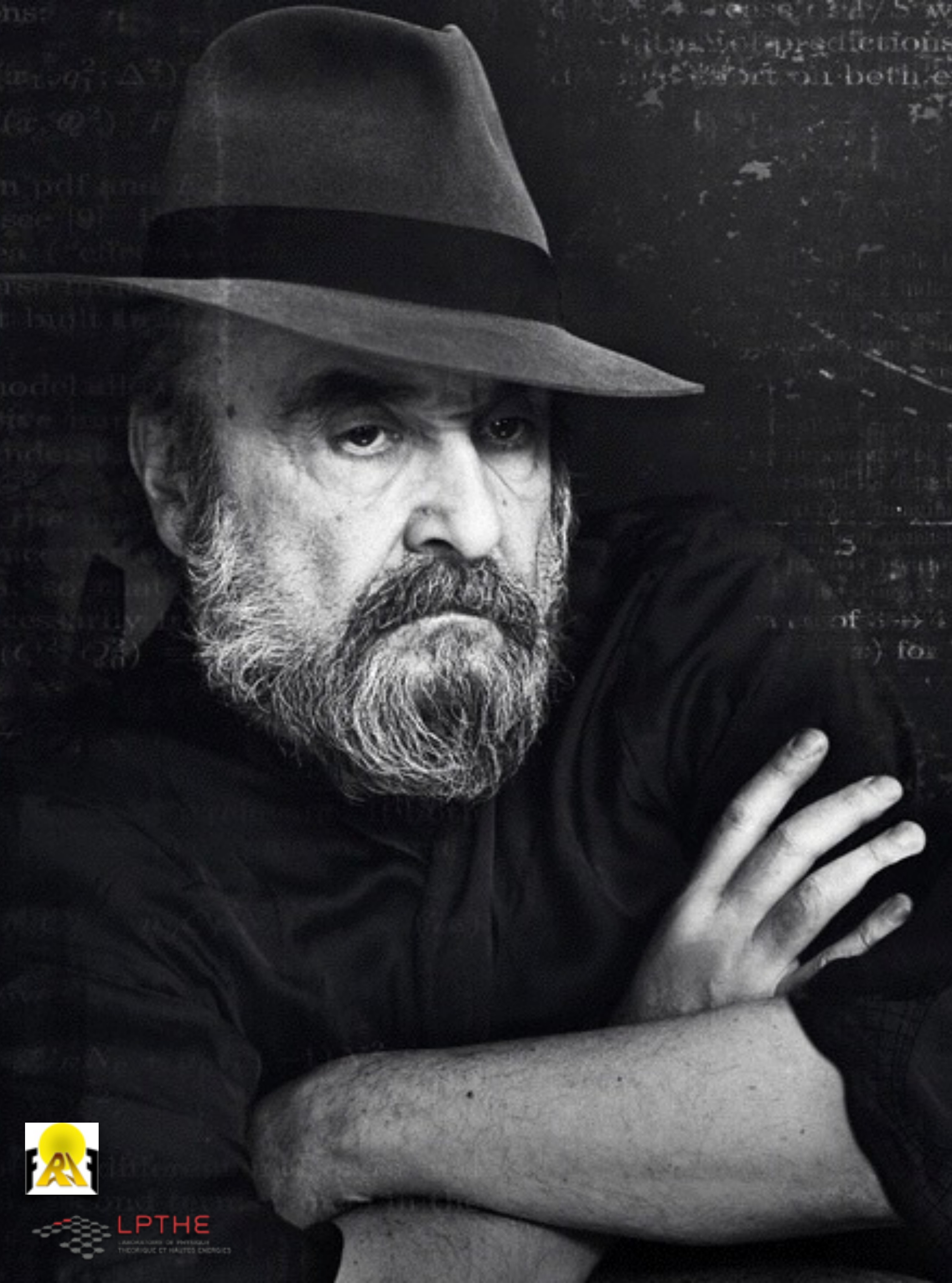


Yuri Fest

a conference in honour of Yuri Dokshitzer, on the occasion of his retirement from the CNRS

LPTHE

DOKSHITZER-GRIBOV-LIPATOV-ALTARELLI-PARISI (DGLAP) EQUATIONS

Calculation of structure functions of deep-inelastic scattering and e^+e^- annihilation by perturbation theory in quantum chromodynamics

Yu. L. Dokshitser

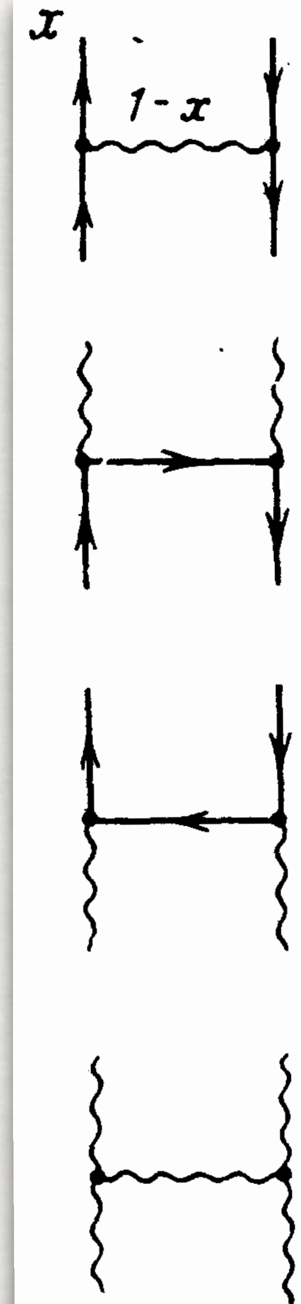
Leningrad Institute of Nuclear Physics, USSR Academy of Sciences

3057 citations

(Submitted April 20, 1977)
Zh. Eksp. Teor. Fiz. 73, 1216–1240 (October 1977)

A model of fermions connected with Yang-Mills fields of the nonabelian gauge group $SU(N)$ is considered. A method based on an analysis of the Feynman diagrams makes it possible to write down in the principal logarithmic approximation a closed expression for the inclusive cross sections of electron scattering by a quark (gluon) in e^+e^- annihilation into a quark (gluon). A specially chosen gauge makes it possible to describe the structure of the deep-inelastic processes in the language of the parton model with virtual quarks and gluons in the role of the partons. The asymptotic properties of the parton distributions are analyzed. An indication of certain duality between the quasi-elastic and Regge limits is discussed. The Gribov-Lipatov relation and the analytic connection (in a certain sense) between the scattering and annihilation channels (the Drell relation) hold in the model under consideration. In addition, a "sum rule in O^2," which unique to the Yang-Mills theory, has been established for the distributions of the number of the partons; this rule singles out a model in which the number of "flavors" is equal to the number of colors. The results are directly applicable to an analysis of the experimental situation in lepton-hadron reactions.

Picture & formalism that provide foundations of quantitative particle physics at high-energy colliders



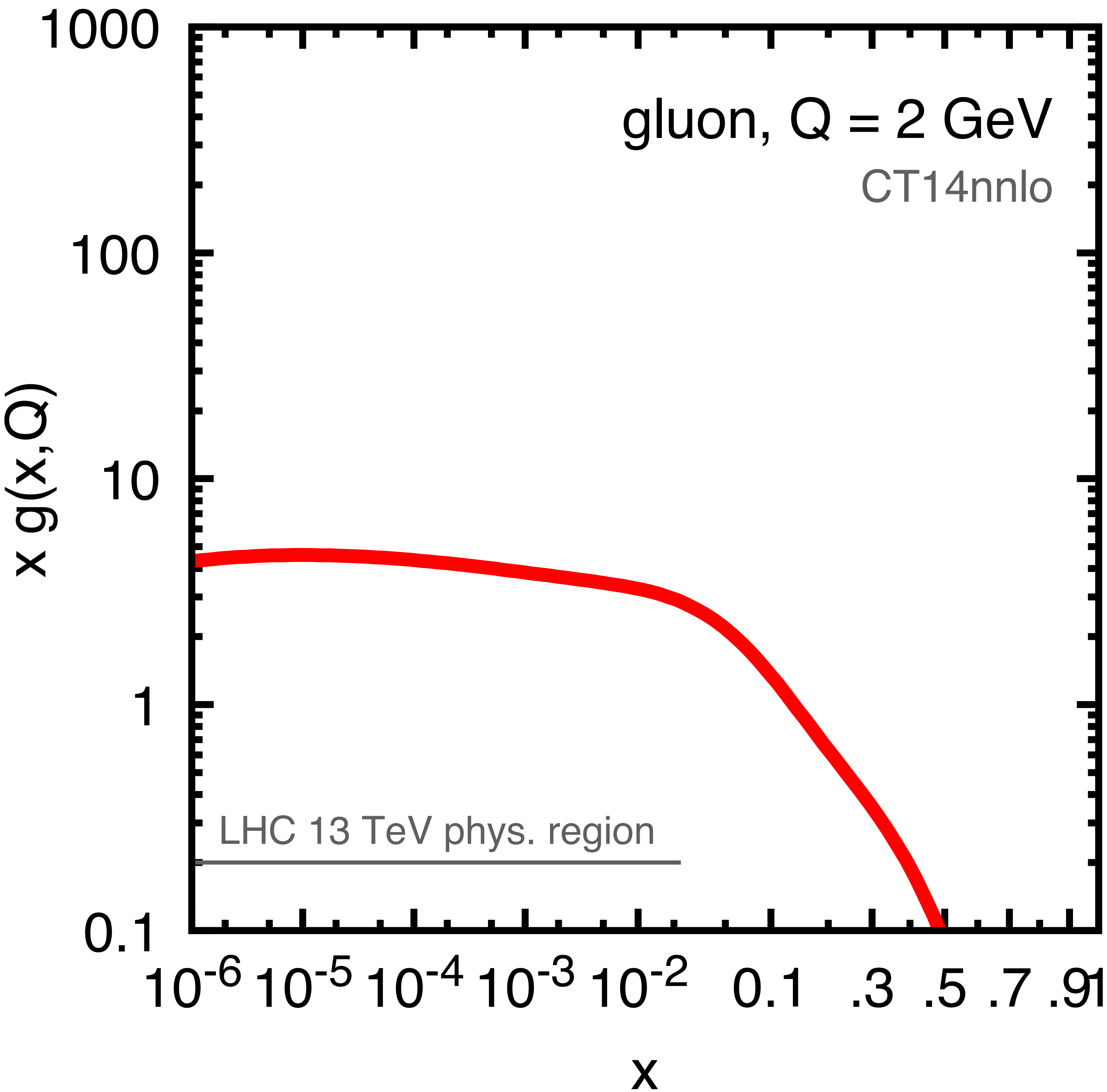
$$\equiv V_F^F(x) = 2\,\frac{1+x^2}{1-x},$$

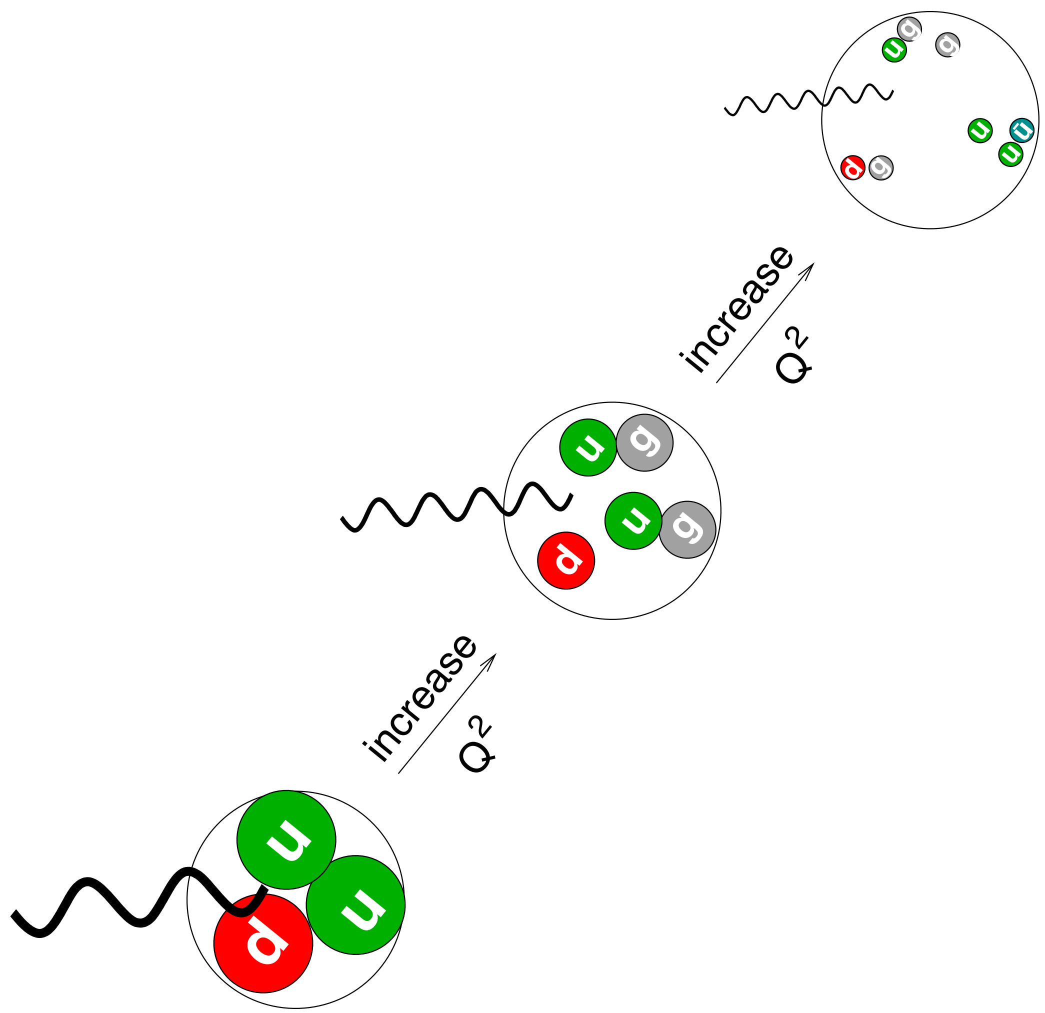
$$\equiv V_F^G(x) = 2\,\frac{1+(1-x)^2}{x},$$

$$\equiv V_G^F(x) = 2\left[x^2+(1-x)^2\right],$$

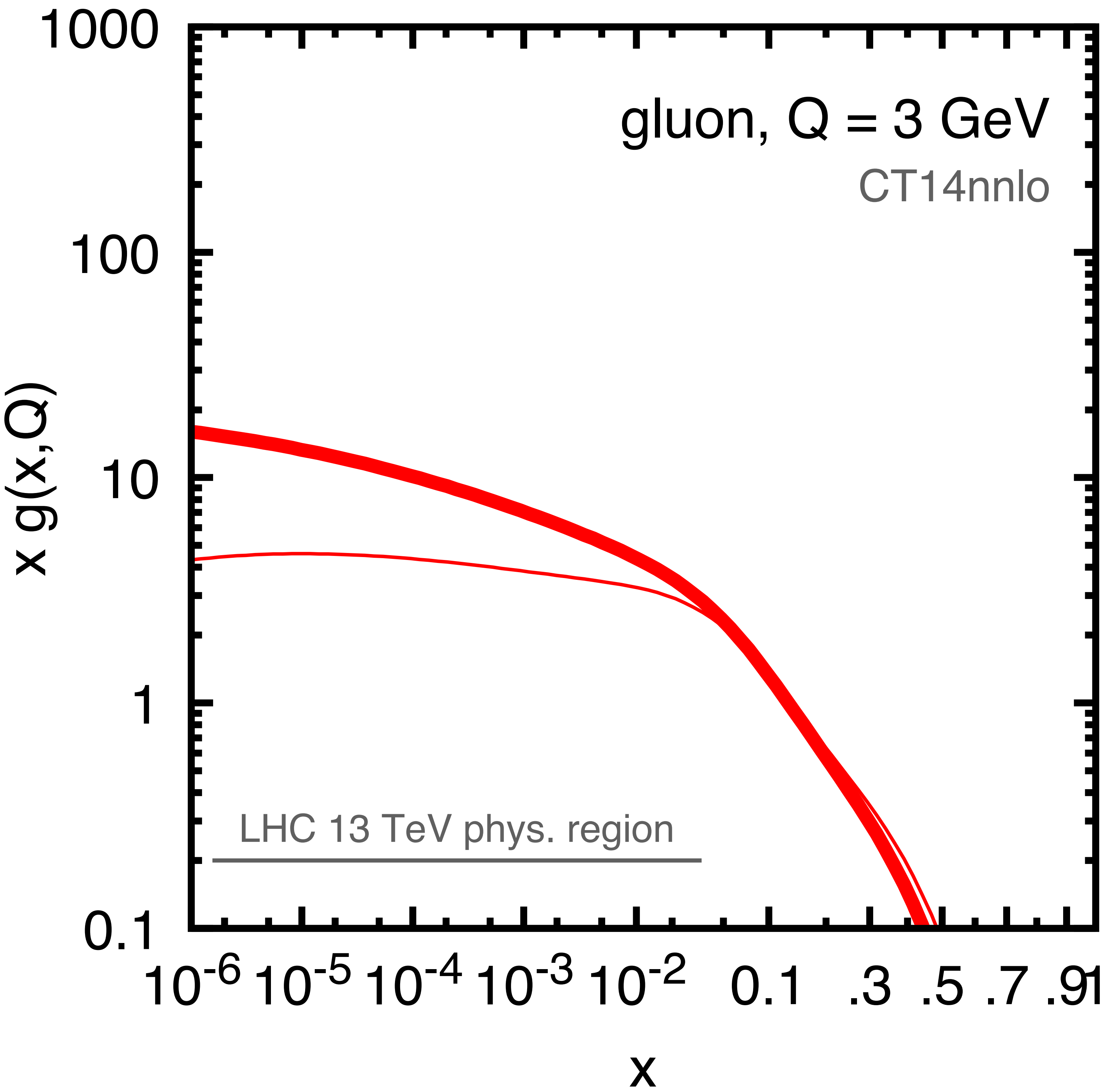
$$\equiv V_G^G(x) = 4x(1-x)\left[1+\frac{1}{x^2}+\frac{1}{(1-x)^2}\right].$$

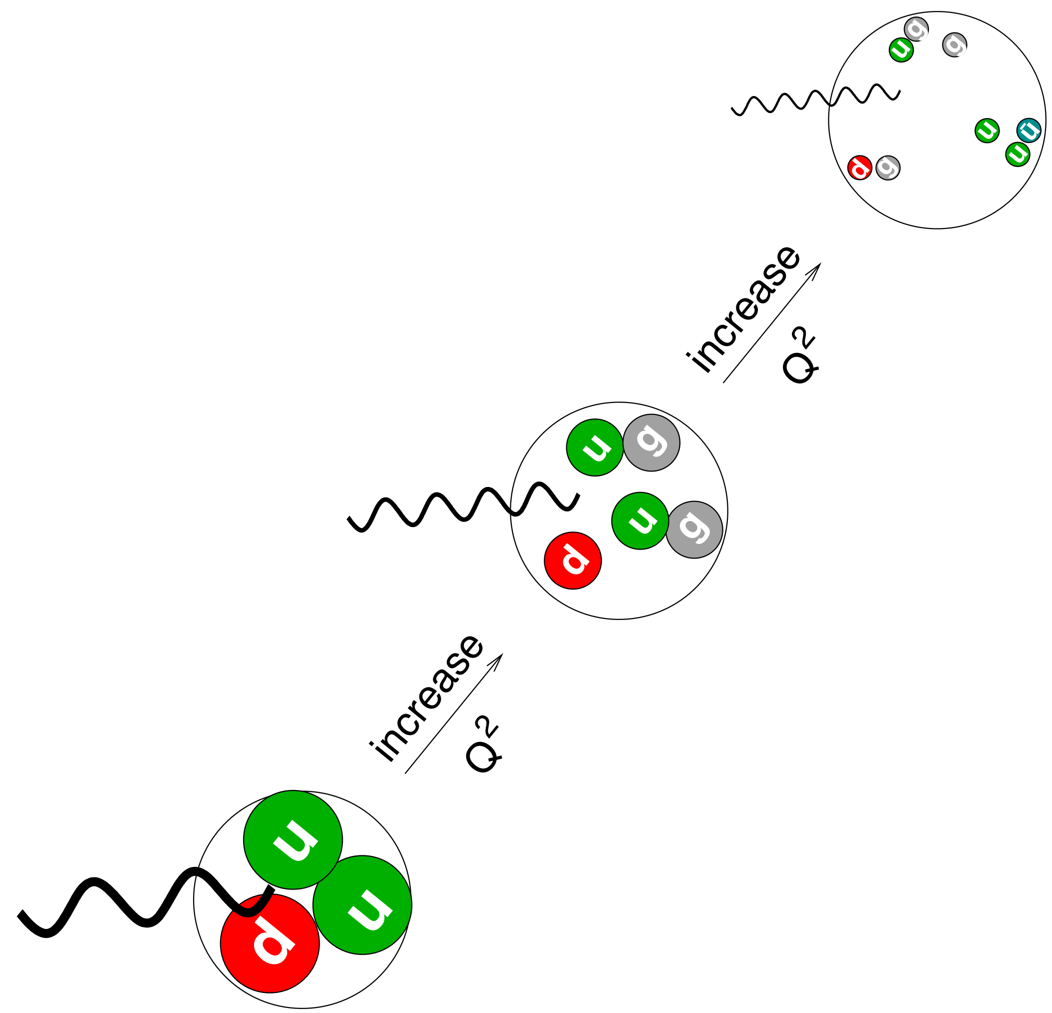
Gluon distribution v. resolution scale Q





Gluon distribution v. resolution scale Q





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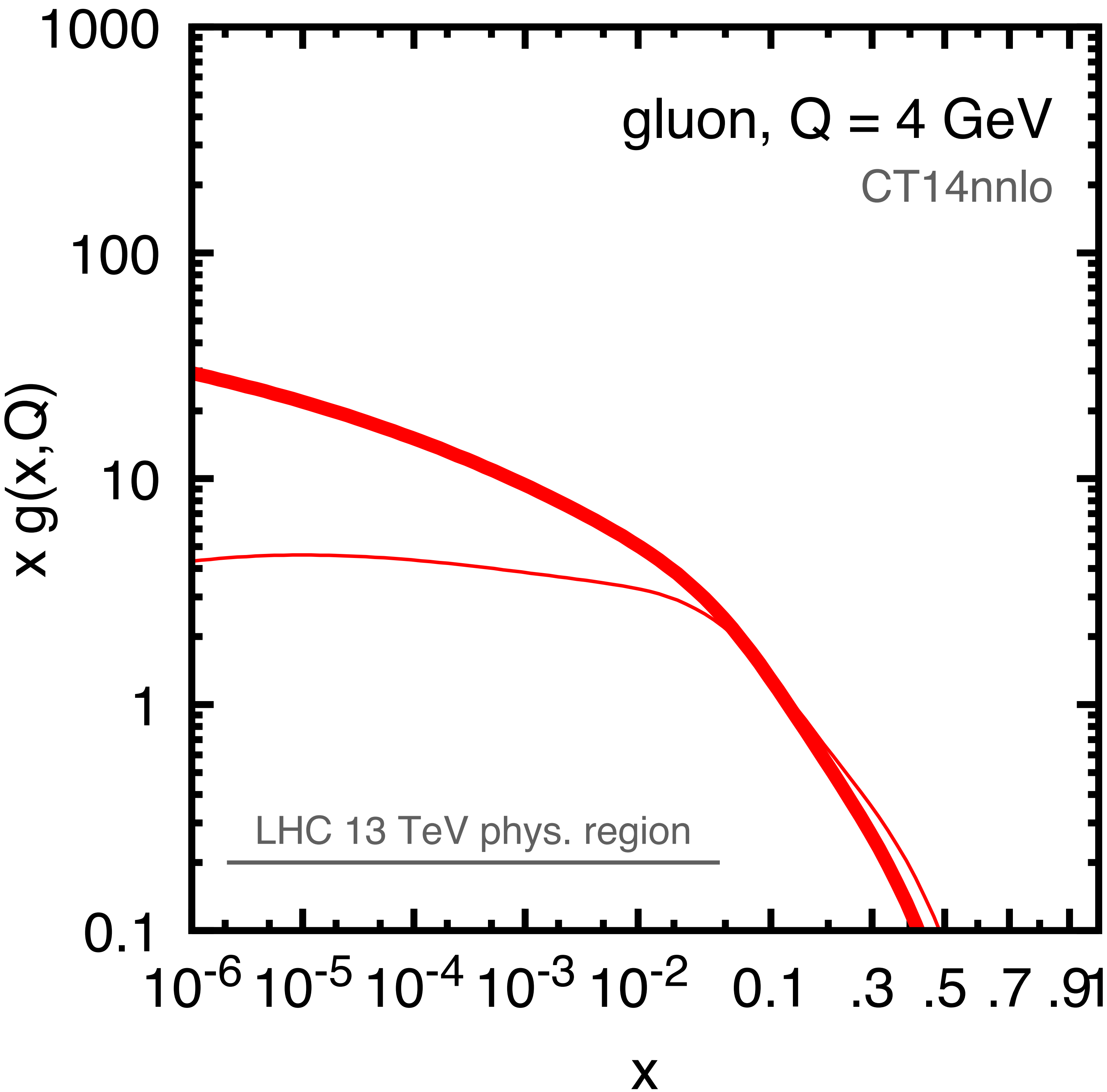
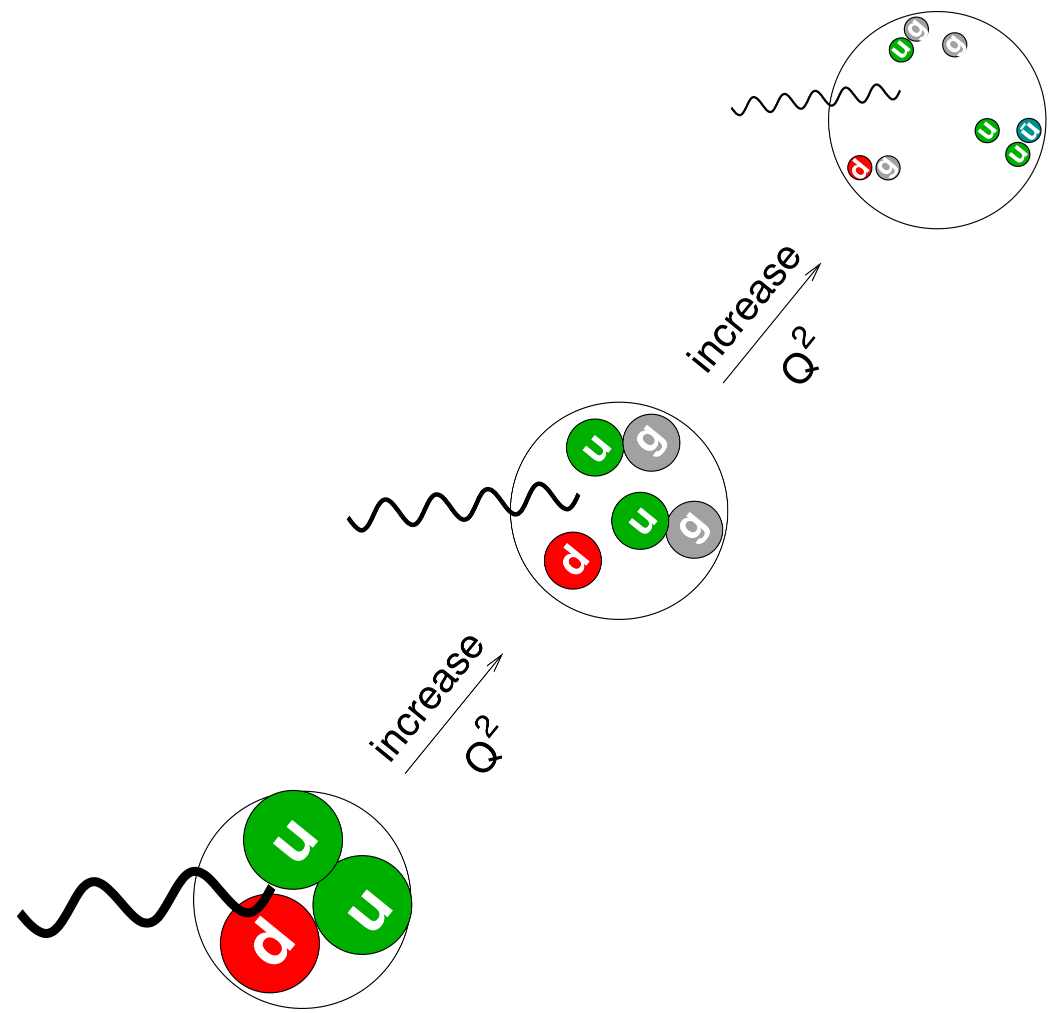
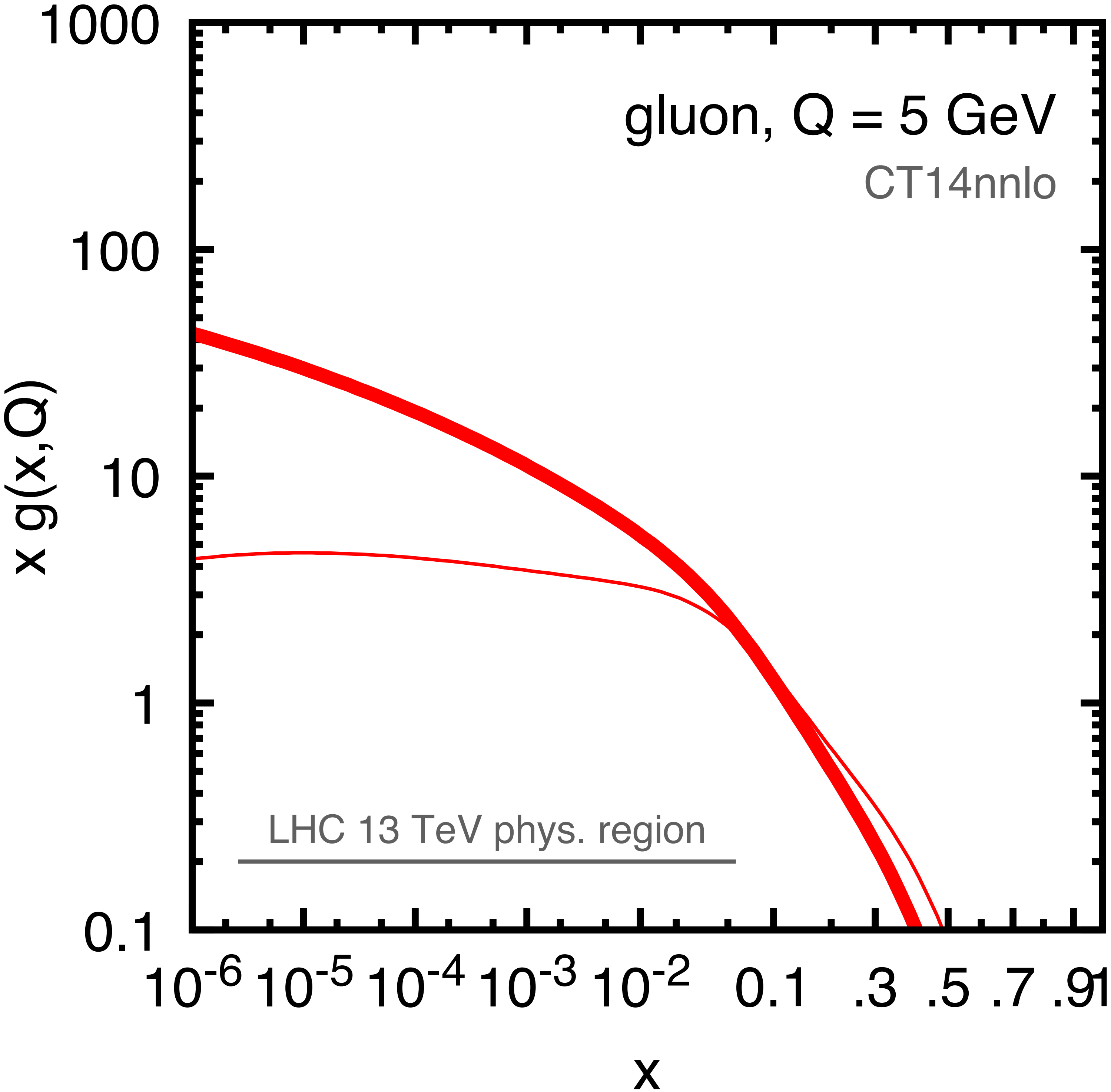
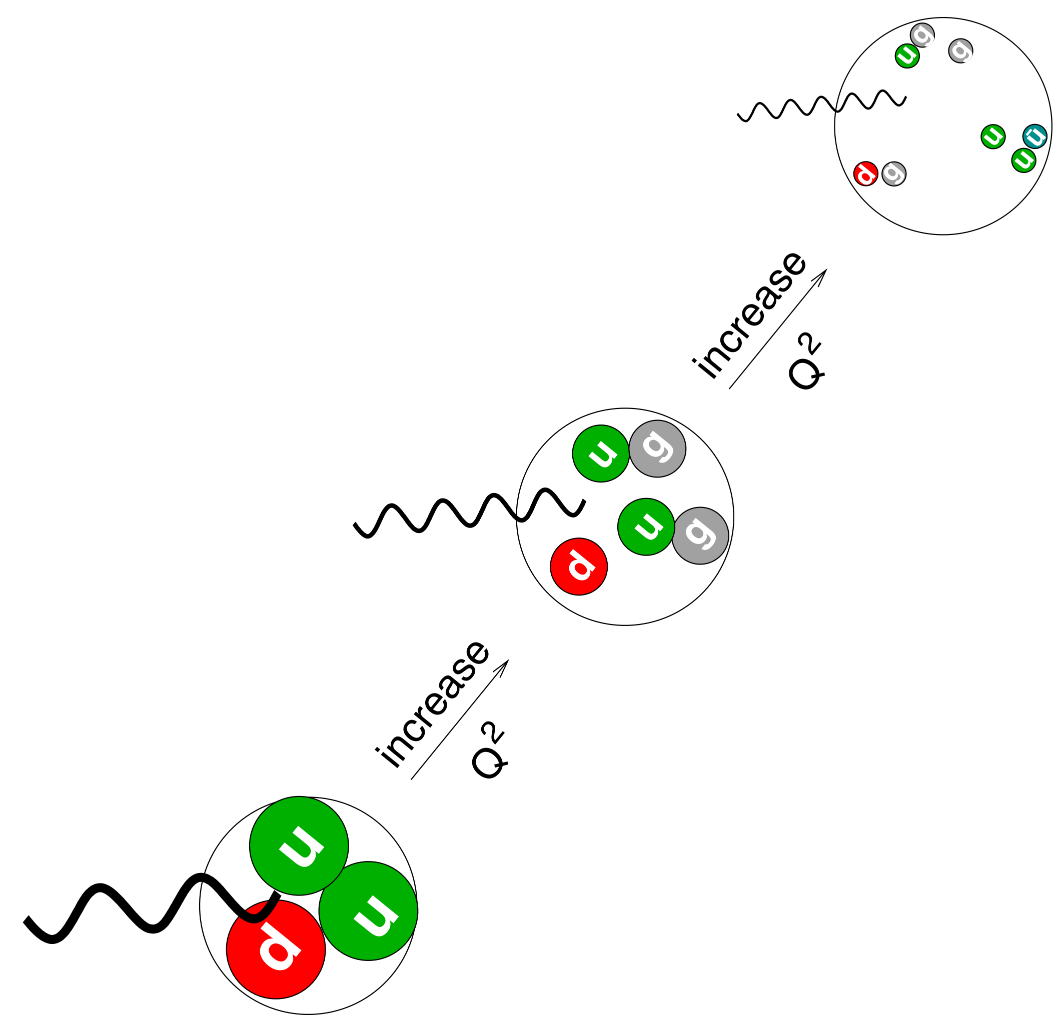




Gluon distribution v. resolution scale Q





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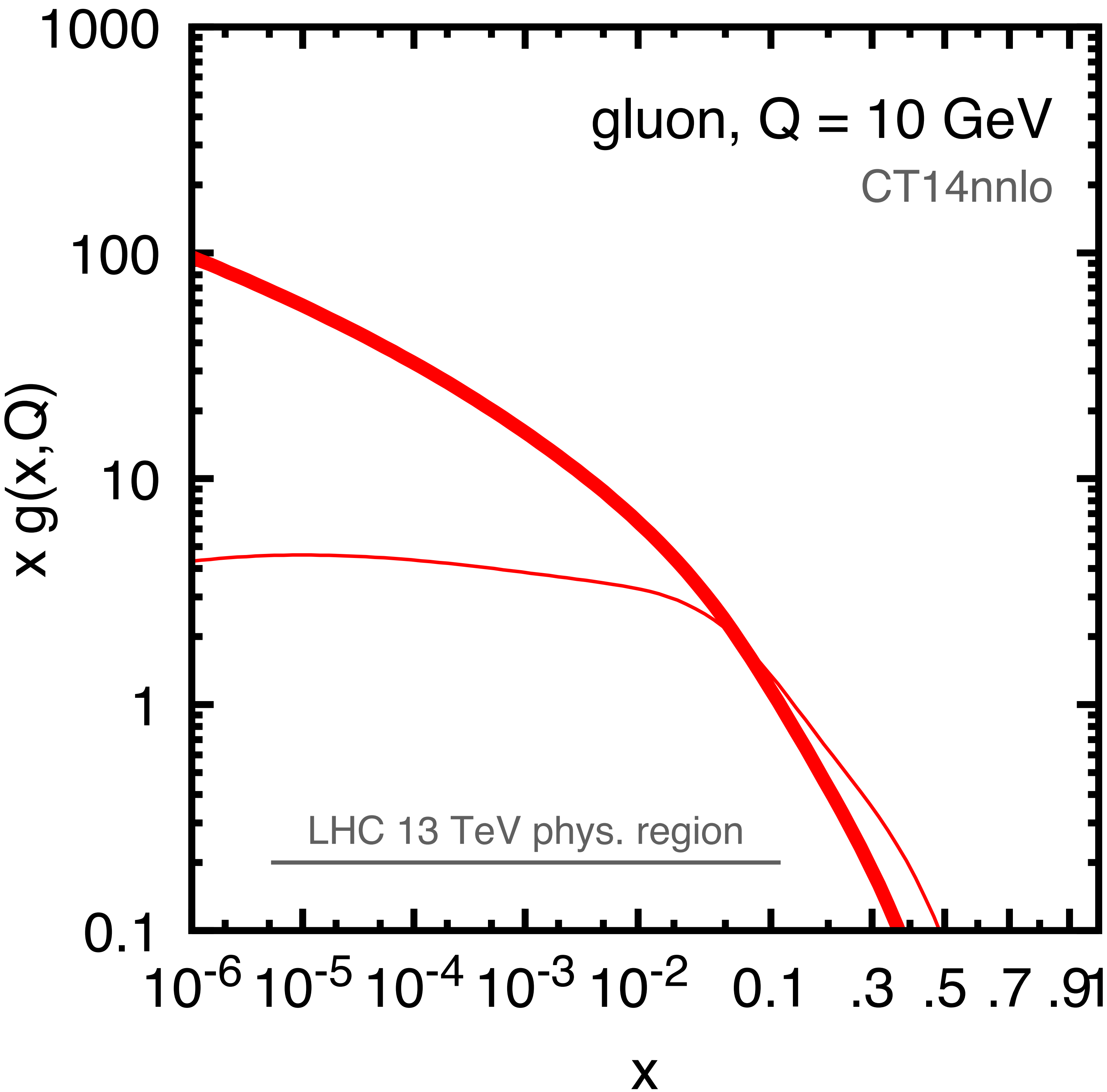

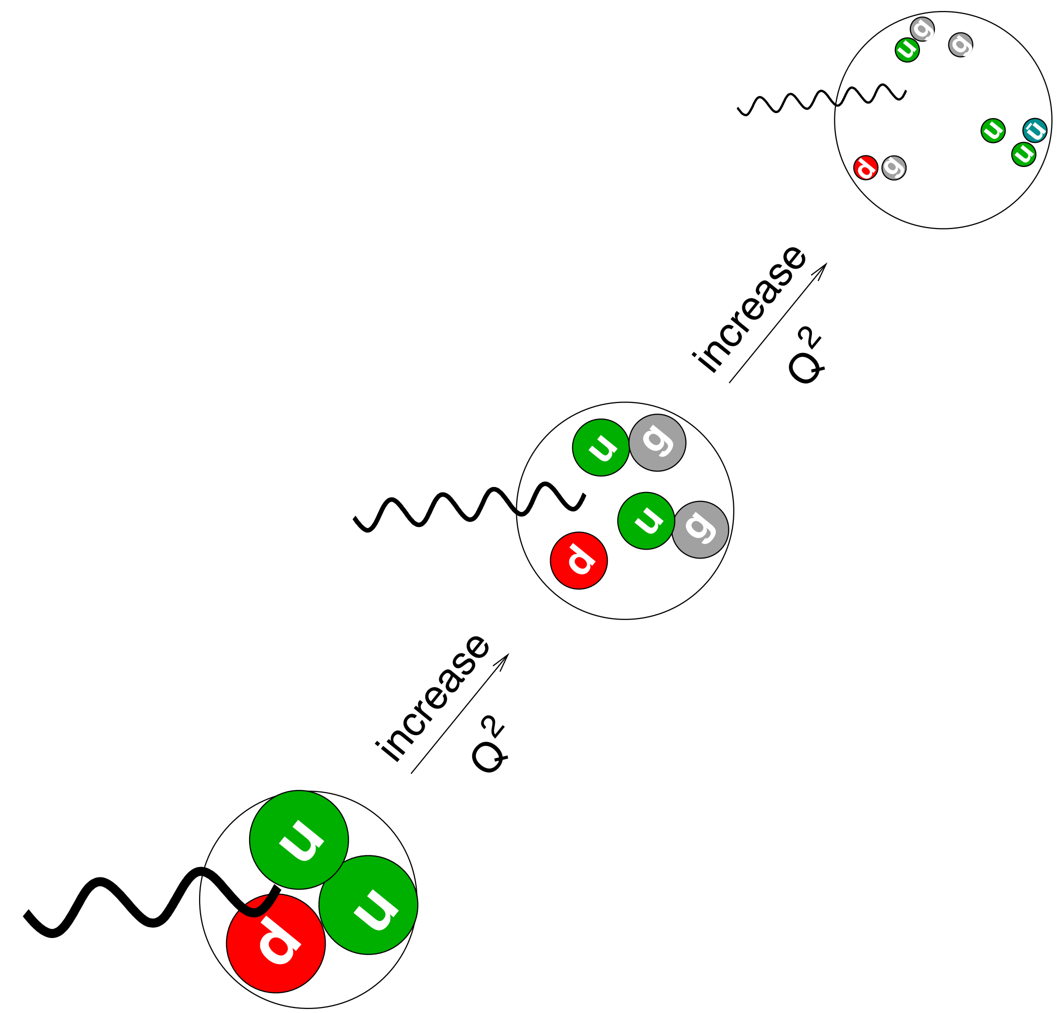

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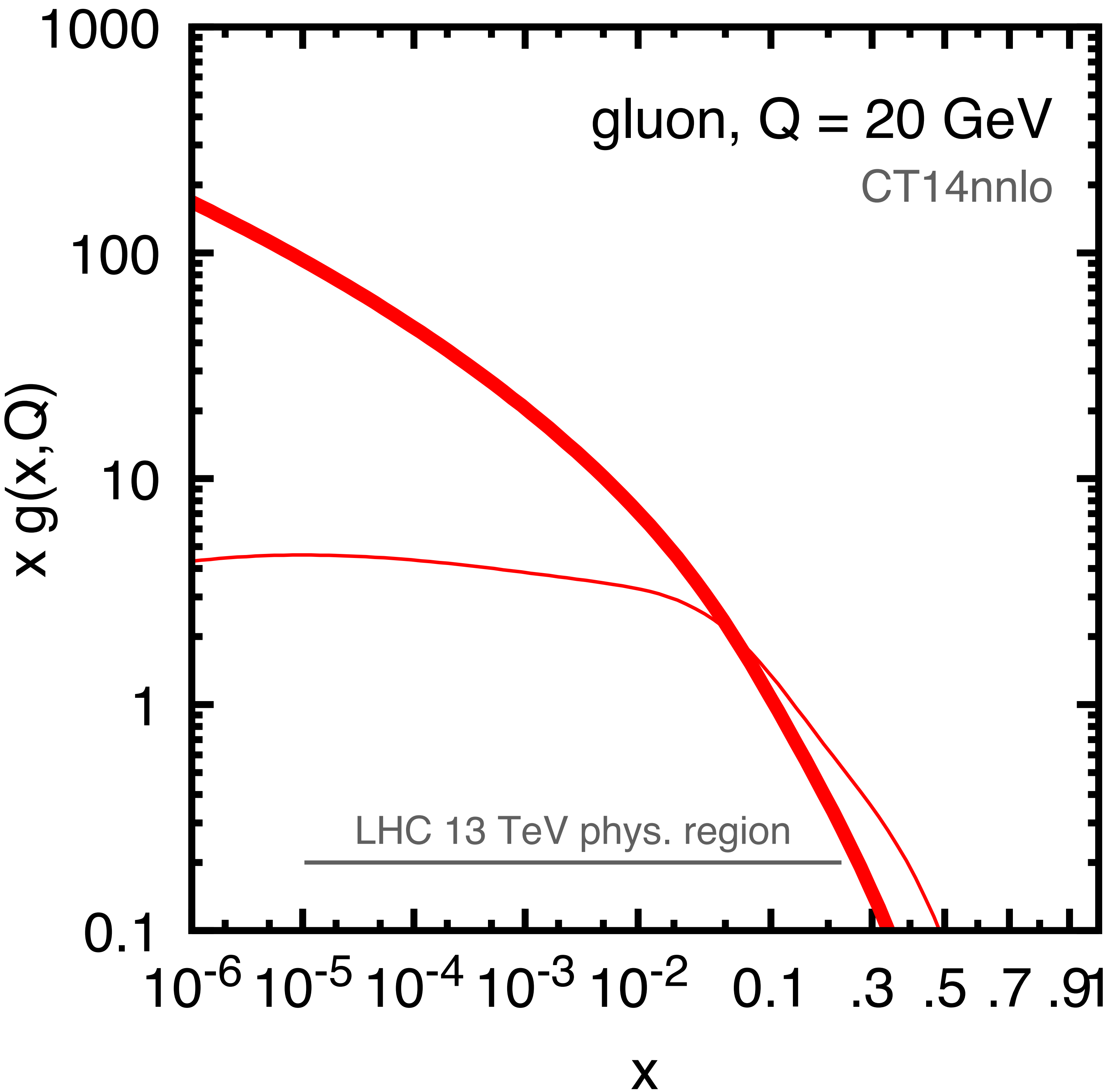

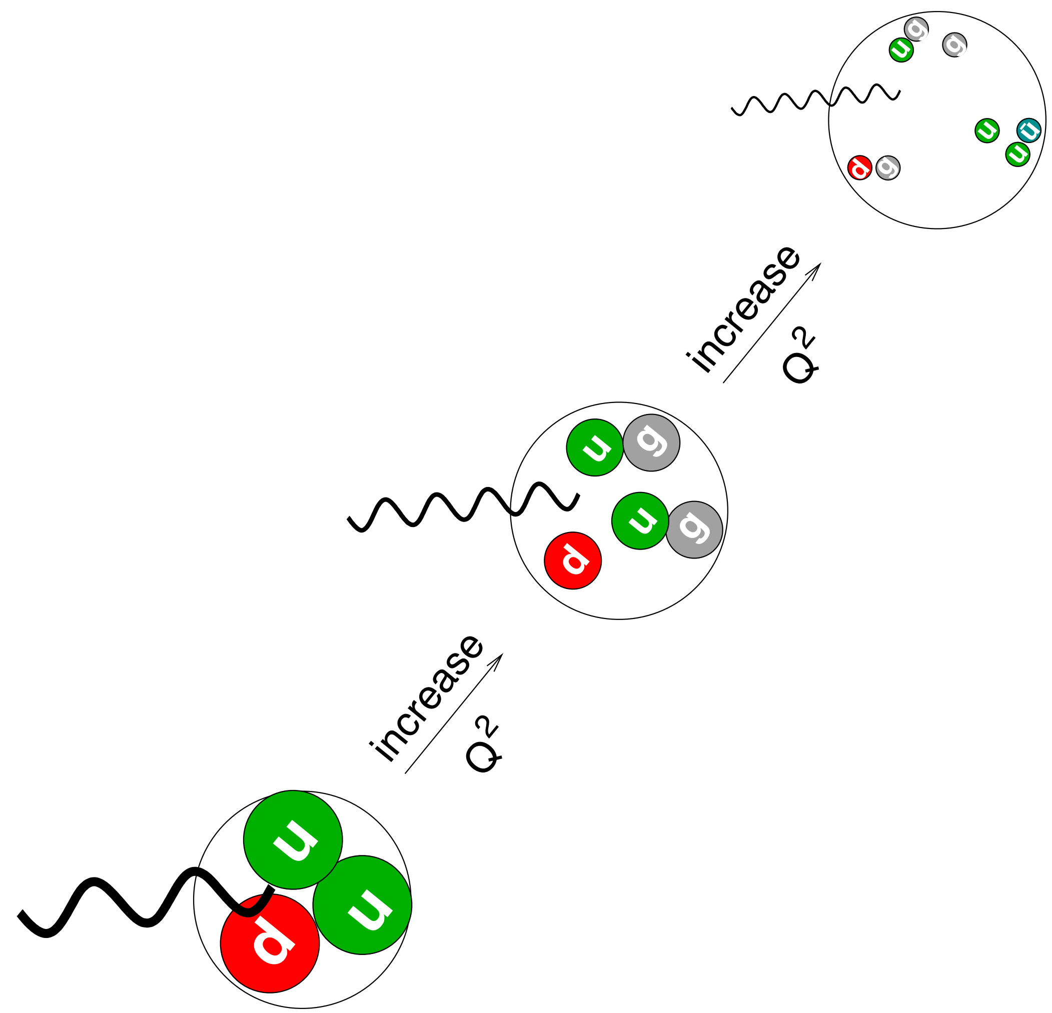

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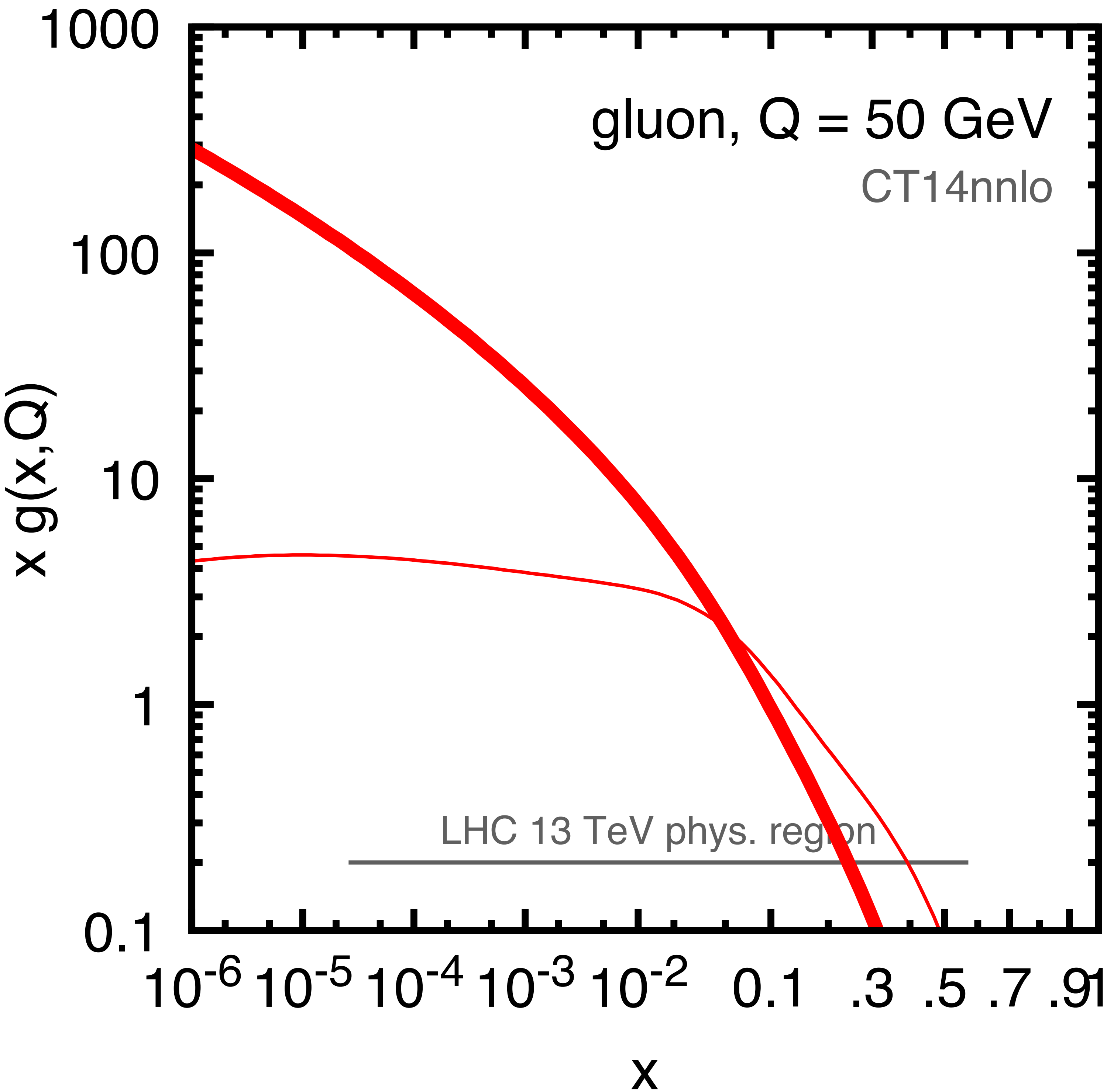

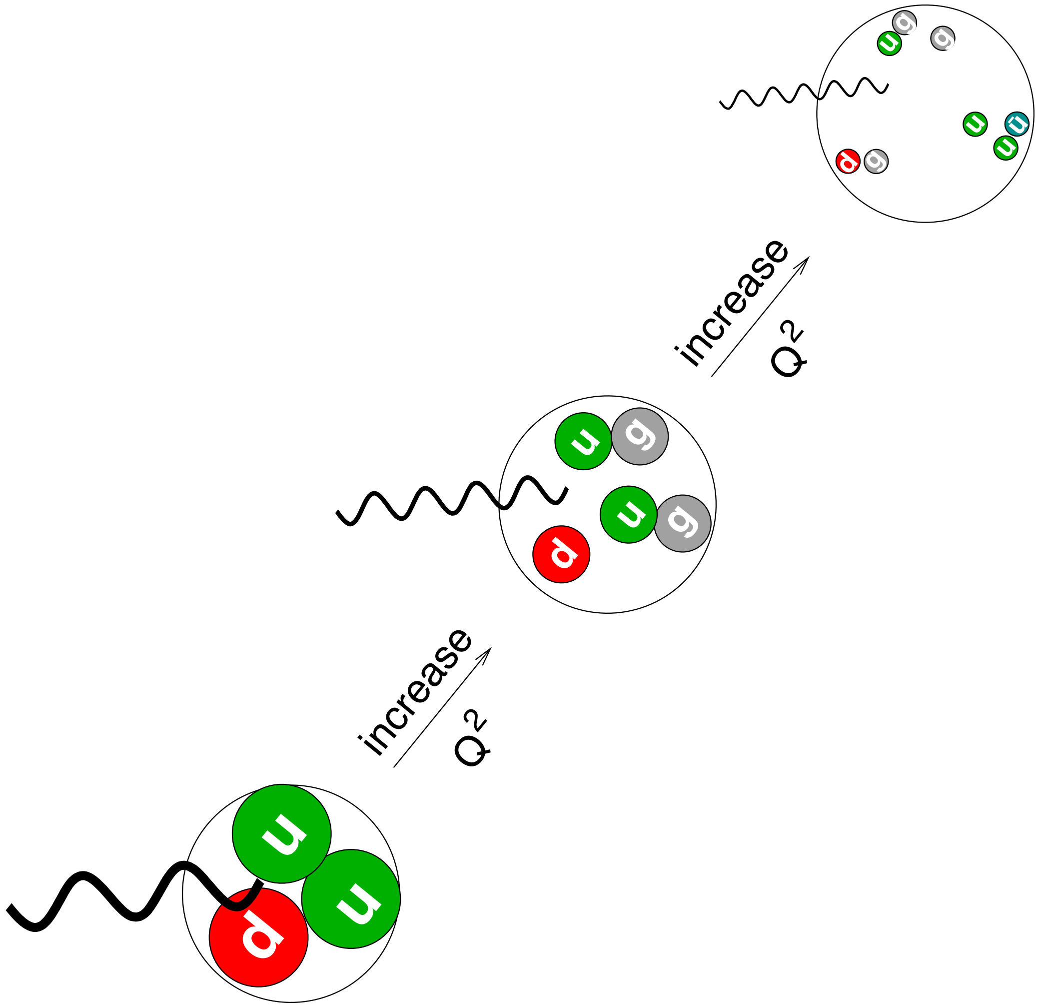

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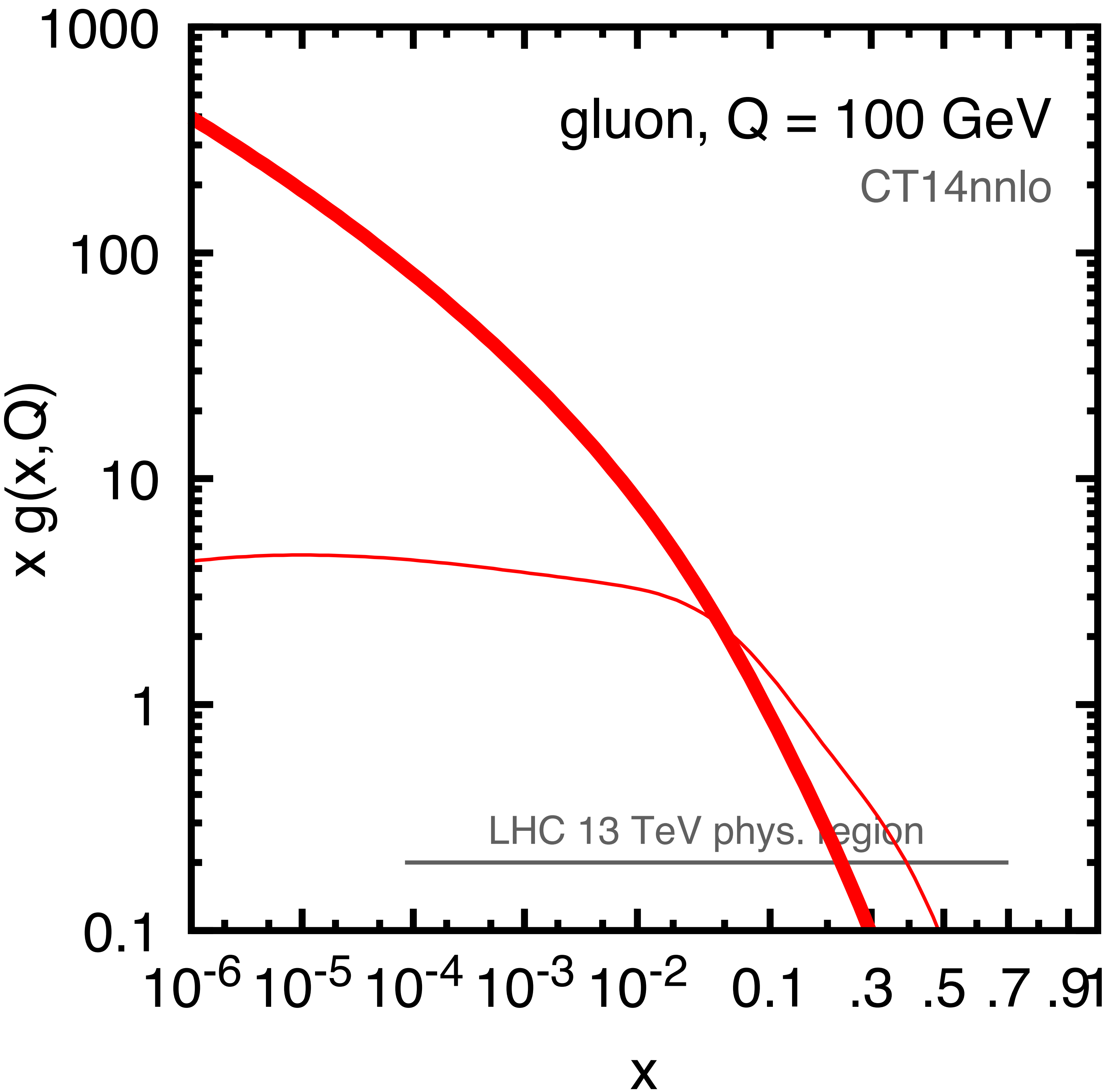

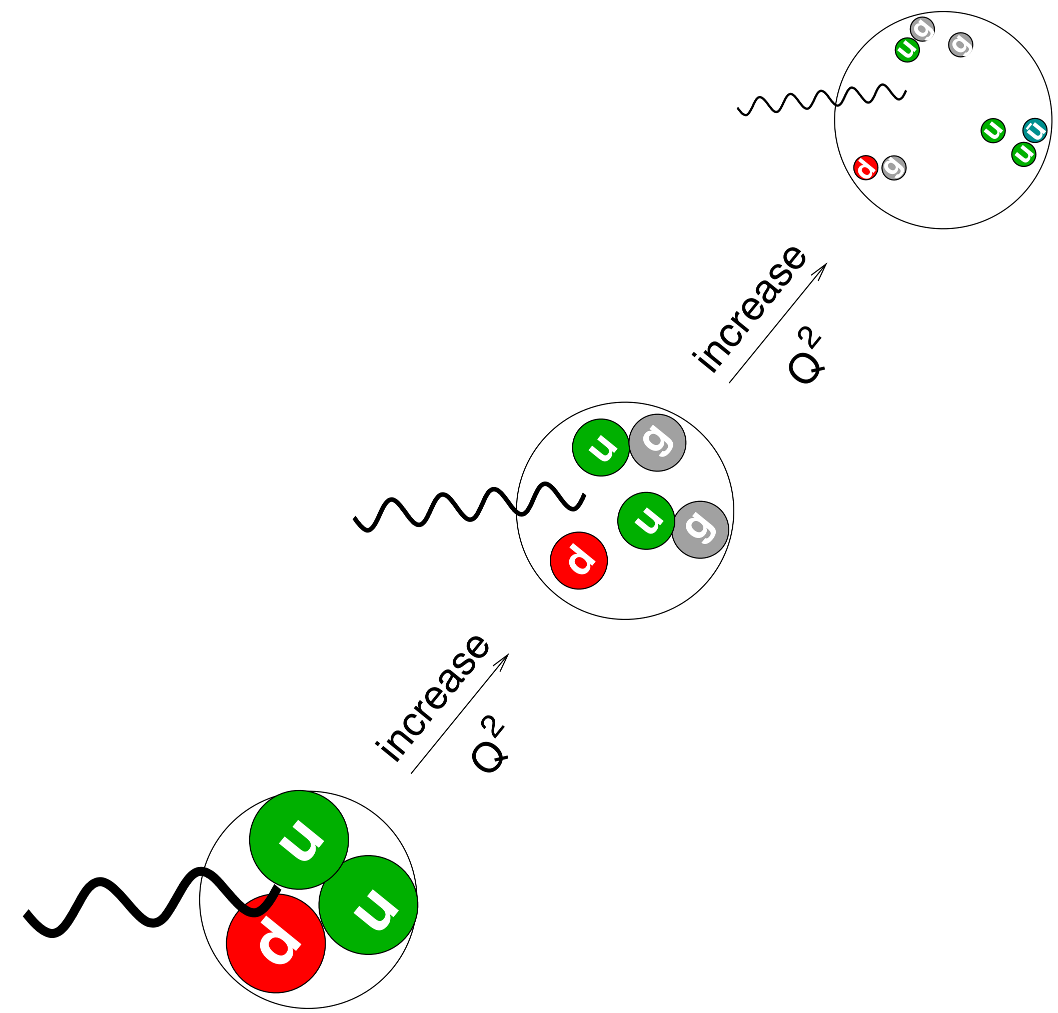

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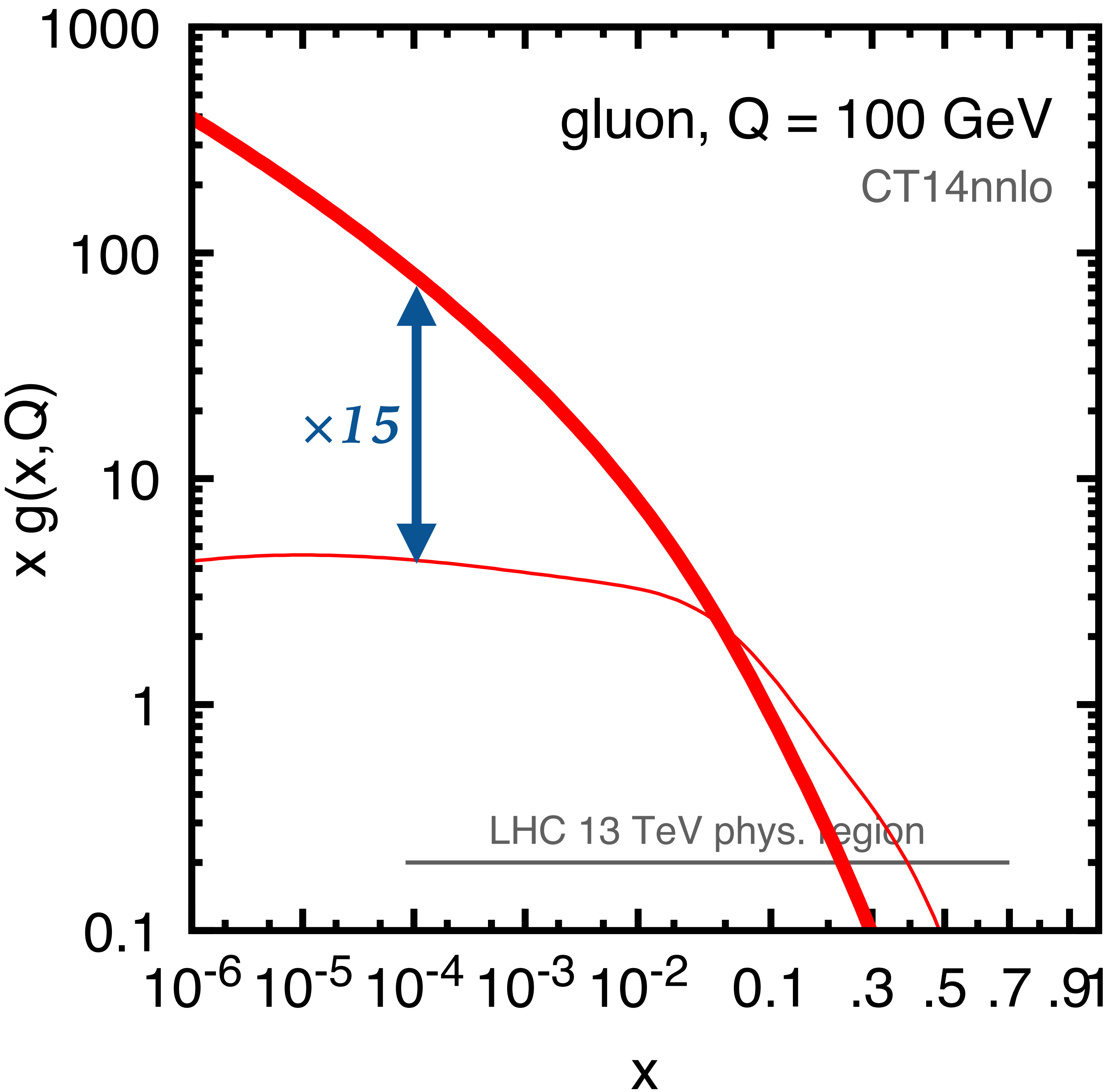
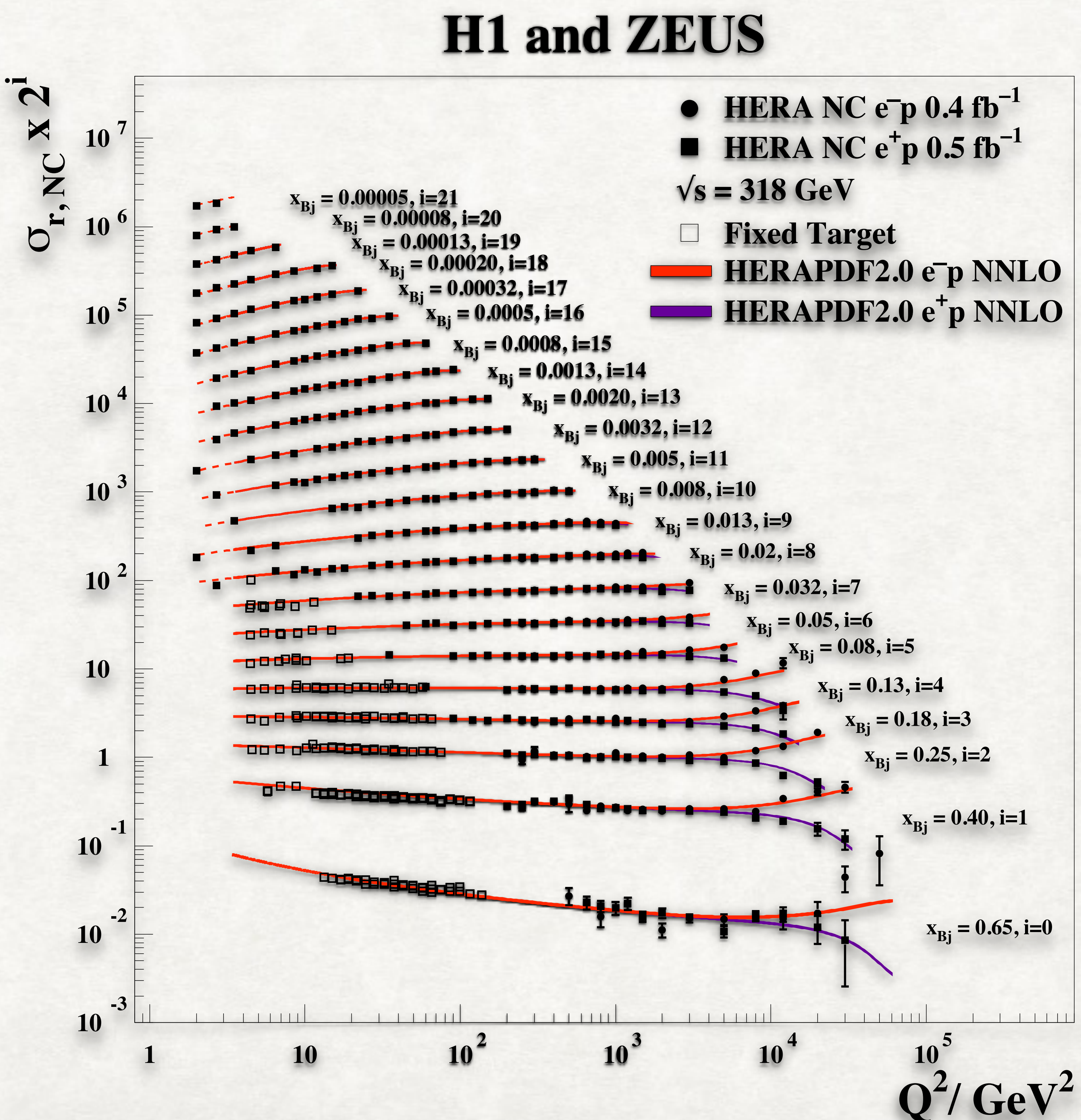


DGLAP evolution changes parton distributions by factors ~ 10

Higgs cross section (13 TeV) would be 6x smaller without DGLAP

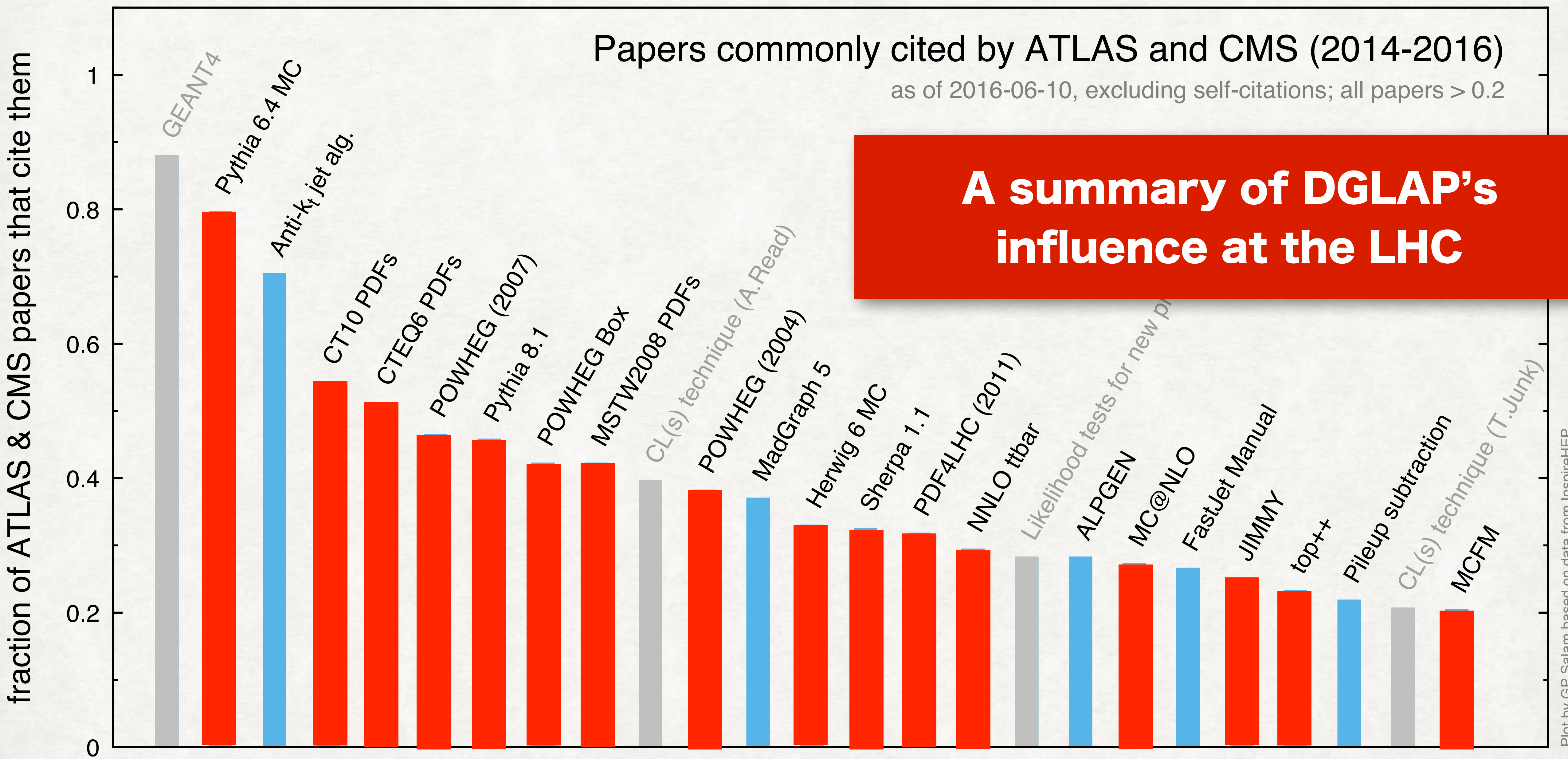
nowadays, used at NNLO, thanks to Moch, Vermaseren & Vogt

DGLAP AND DATA



WHAT DOES THE LHC USE MOST FREQUENTLY?

[based on 422 papers from ATLAS and CMS]



A summary of DGLAP's influence at the LHC

2015 HIGH ENERGY AND PARTICLE PHYSICS PRIZE

awarded to James D. Bjorken “for his prediction of scaling behaviour in the structure of the proton that led to a new understanding of the strong interaction”, and to

Guido Altarelli, **Yuri L. Dokshitzer**, Lev Lipatov, and Giorgio Parisi “for developing a probabilistic field theory framework for the dynamics of quarks and gluons, enabling a quantitative understanding of high-energy collisions involving hadrons”

PHYSICS REPORTS (Review Section of Physics Letters) 58, No. 5 (1980) 269–395. North-Holland Publishing Company

803 citations

HARD PROCESSES IN QUANTUM CHROMODYNAMICS

Yu.L. DOKSHITZER, D.I. DYAKONOV and S.I. TROYAN

Leningrad Nuclear Physics Institute, Gatchina,
Leningrad 188350, U.S.S.R.

Received 28 May 1979

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Received 28 May 1979

Z. Phys. C – Particles and Fields 27, 65–72 (1985)

575 citations

Similarity of Parton and Hadron Spectra in QCD Jets

Ya.I. Azimov, Yu.L. Dokshitzer, V.A. Khoze and S.I. Troyan
Academy of Sciences of the USSR Leningrad Nuclear Physics Institute, SU-188350 Gatchina, Leningrad District, USSR

Received 14 May 1984

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HARD PROCESSES IN QUA...

Yu.L. DOKSH...

PRODUCTION AND DECAY PROPERTIES OF ULTRA-HEAVY QUARKS ☆

539 citations

I. BIGI [1]
Stanford Linear Accelerator Center, Stanford University, Stanford, CA 94305, USA

Y. DOKSHITZER, V. KHOZE
Leningrad Nuclear Physics Institute, Leningrad, USSR

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and

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CERN, CH-1211 Geneva 23, Switzerland

Received 8 September 1986

PHYSICS LETTERS B
Volume 181, number 1,2

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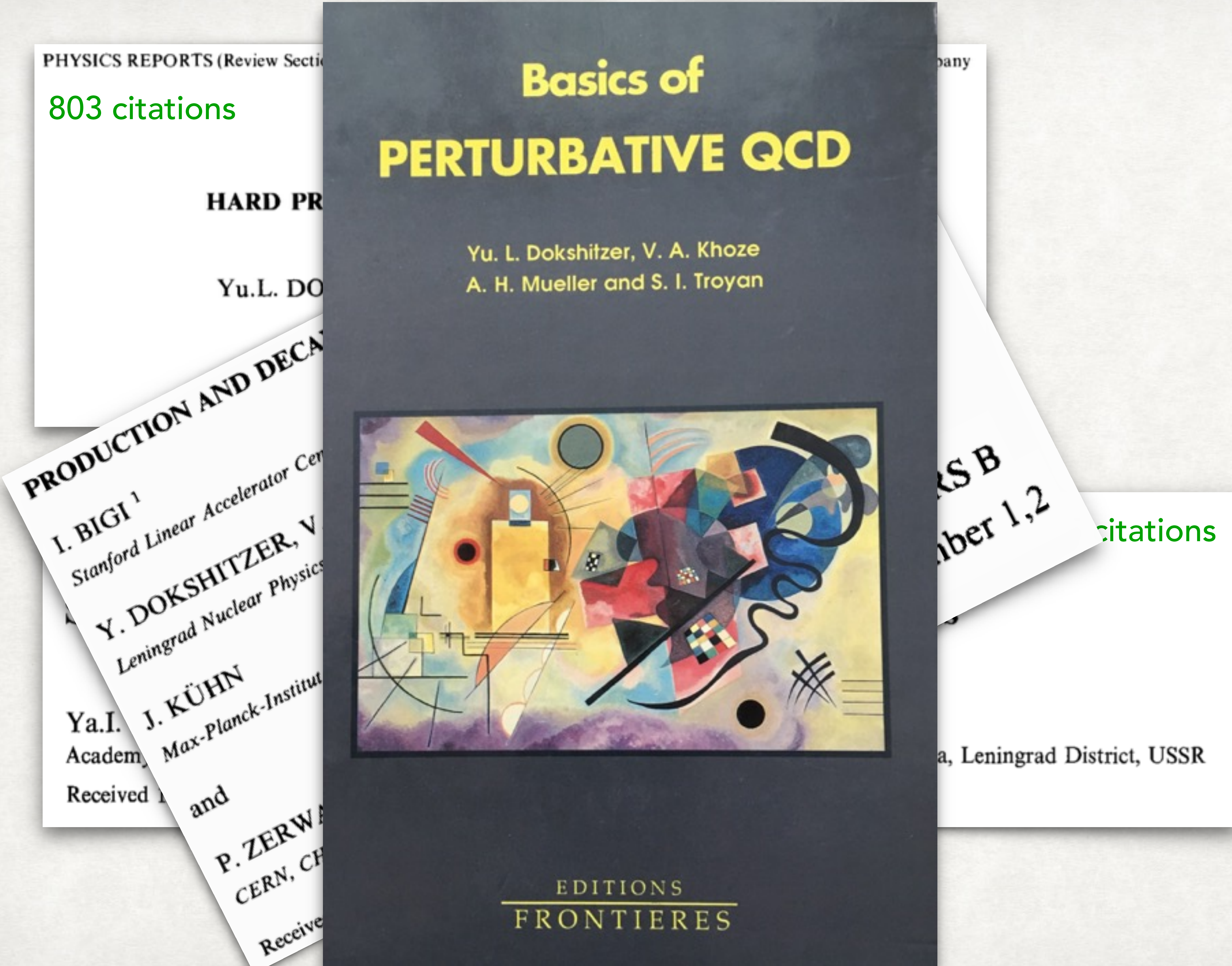
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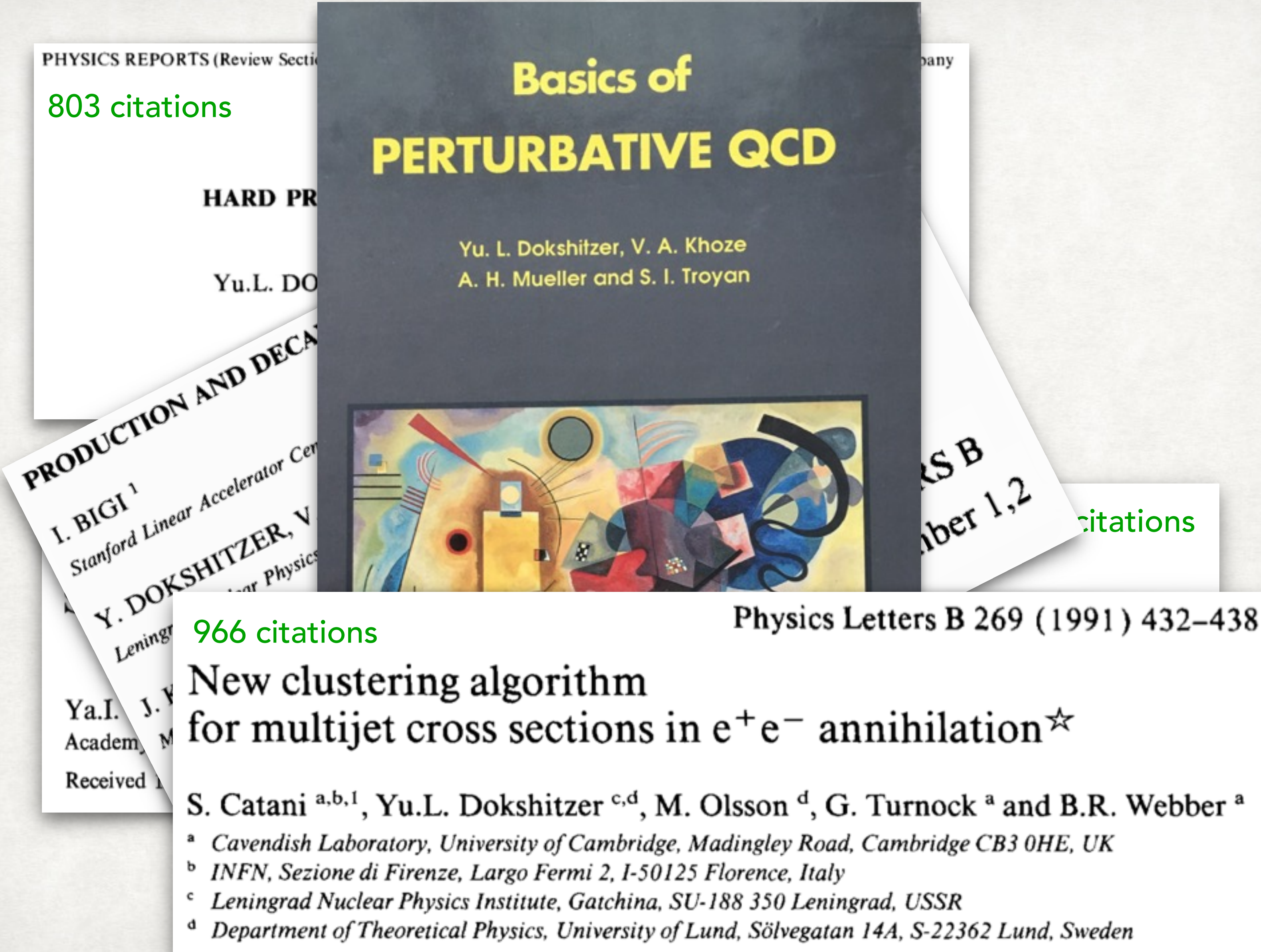
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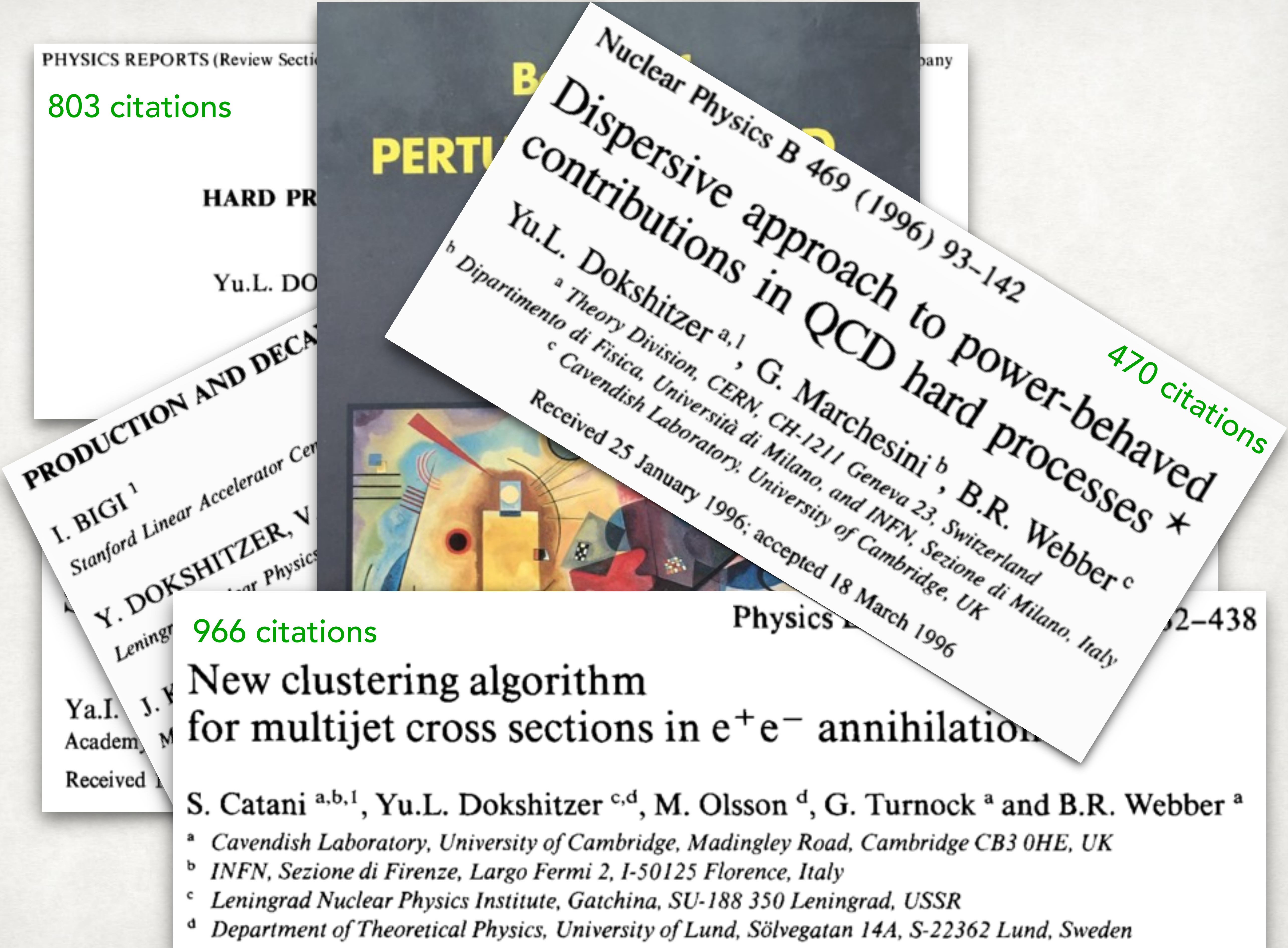
966 citations
Physics Letters B 269 (1991) 432–438
New clustering algorithm
for multijet cross sections in e+e− annihilation☆
S. Catani a,b,1, Yu.L. Dokshitzer c,d, M. Olsson d, G. Turnock a and B.R. Webber a
a Cavendish Laboratory, University of Cambridge, Madingley Road, Cambridge CB3 0HE, UK
b INFN, Sezione di Firenze, Largo Fermi 2, I-50125 Florence, Italy
c Leningrad Nuclear Physics Institute, Gatchina, SU-188 350 Leningrad, USSR
d Department of Theoretical Physics, University of Lund, Sölvegatan 14A, S-22362 Lund, Sweden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Nuclear Physics B 469 (1996) 93–142
Dispersive approach to power-behaved contributions in QCD hard processes ⋆
Yu.L. Dokshitzer a,1, G. Marchesini b, B.R. Webber c
a Theory Division, CERN, CH-1211 Geneva 23, Switzerland
b Dipartimento di Fisica, Università di Milano, and INFN, Sezione di Milano, Italy
c Cavendish Laboratory, University of Cambridge, UK
Received 25 January 1996; accepted 18 March 1996
470 citations
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Physics
New clustering algorithm
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803 citations

HARD PR

906 citations

Nuclear Physics B 484 (1997) 265–282

Radiative energy loss and $p_\perp$-broadening of high energy partons in nuclei

R. Baier [a], Yu.L. Dokshitzer [b,1], A.H. Mueller [c,2], S. Peigné [e], D. Schiff [d]

[a] Fakultät für Physik, Universität Bielefeld, D-33501 Bielefeld, Germany

[b] INFN, Sezione di Milano, Milan, Italy

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[e] NORDITA, DK-2100 Copenhagen Ø, Denmark

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...R. Webber [c]
...Switzerland
..., Sezione di Milano, Italy
...mbridge, UK
18 March 1996

Physics L... ...2–438

...algorithm
...jet cross sections in e^+e^- annihilation

S. Catani [a,b,1], Yu.L. Dokshitzer [c,d], M. Olsson [d], G. Turnock [a] and B.R. Webber [a]

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QCD analysis of near-to-planar 3-jet events

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Sezione di Pavia, Italy
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JHEP07(2000)001

...oadening of high
...uclei

R. Baier [a], Yu.L. D... ...r [c,2], S. Peigné [e], D. Schiff [d]

[a] Fakultät für Physik, ... 3501 Bielefeld, Germany
[b] INFN, Sezion... ...lan, Italy
[c] Physics Department, Columbia Univer... New York, NY 10027, USA
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S. Catani [a,b,1], Yu.L. Dokshitzer [c,d], M. Olsson [d], G. Turnock [a] and B.R. Webber [a]

[a] *Cavendish Laboratory, University of Cambridge, Madingley Road, Cambridge CB3 0HE, UK*
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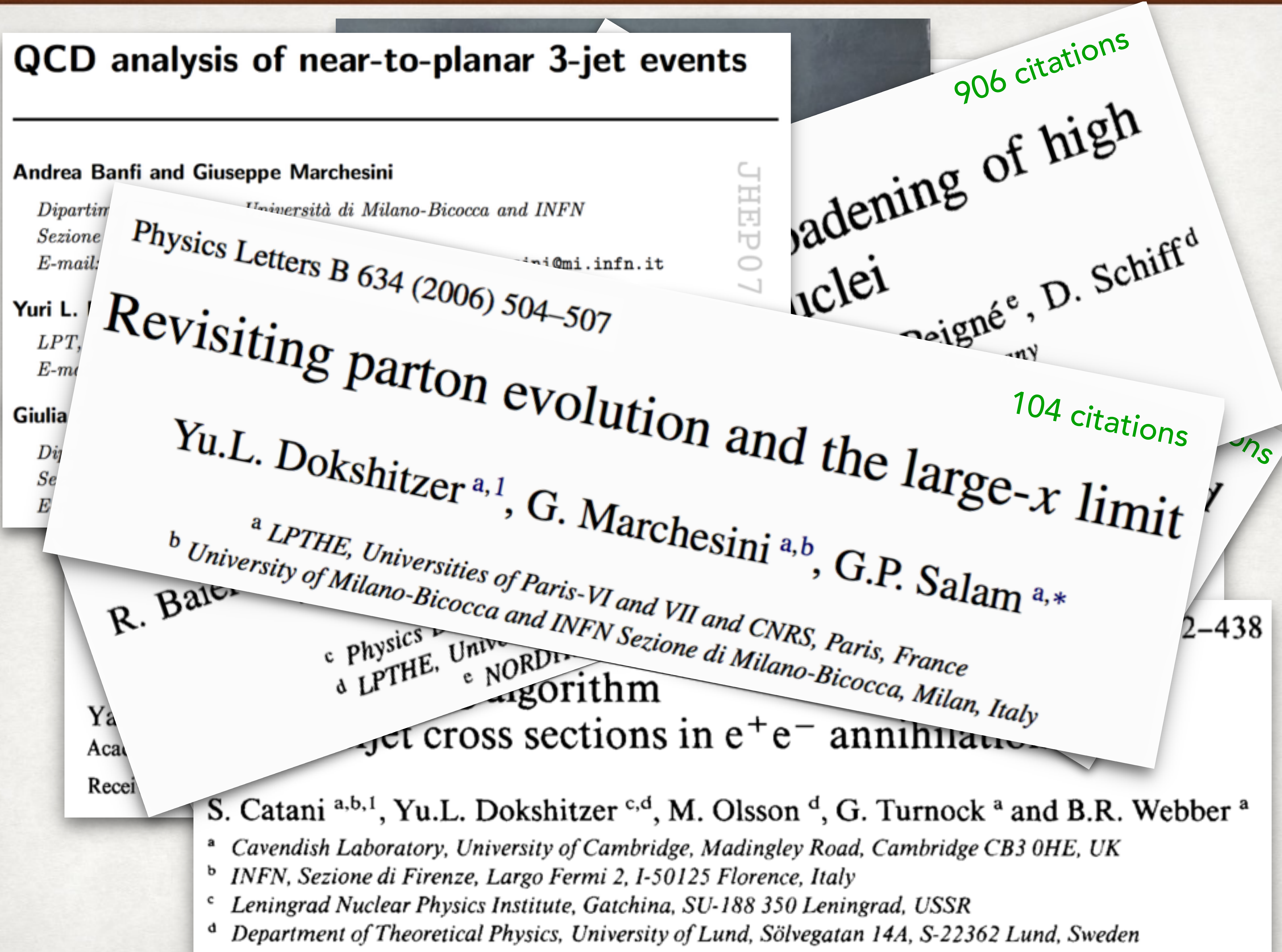
[d] *Department of Theoretical Physics, University of Lund, Sölvegatan 14A, S-22362 Lund, Sweden*


QCD analysis of near-to-planar 3-jet events
Andrea Banfi and Giuseppe Marchesini
JHEP07
906 citations
Physics Letters B 634 (2006) 504–507
Revisiting parton evolution and the large-x limit
104 citations
Yu.L. Dokshitzer a,1, G. Marchesini a,b, G.P. Salam a,*
a LPTHE, Universities of Paris-VI and VII and CNRS, Paris, France
b University of Milano-Bicocca and INFN Sezione di Milano-Bicocca, Milan, Italy
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D. Schiff
Physics Letters B 634 (2006) 504–507
Revisiting parton evolution
Yu.L. Dokshitzer a, 1
92 citations
PHYSICAL REVIEW D 83, 071501(R) (2011)
Four-jet production at LHC and Tevatron in QCD
B. Blok,1,* Yu. Dokshitzer,2,† L. Frankfurt,3,‡ and M. Strikman4,§
1Department of Physics, Technion—Israel Institute of Technology, 32000 Haifa, Israel
2Laboratory of Theoretical High Energy Physics (LPTHE), University Paris 6, Paris, France;
on leave of absence: PNPI, St. Petersburg, Russia
3School of Physics and Astronomy, Raymond and Beverly Sackler Faculty of Exact Sciences, Tel Aviv University,
69978 Tel Aviv, Israel
4Physics Department, Penn State University, University Park, Pennsylvania, USA
(Received 1 October 2010; published 14 April 2011)
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of Cambridge, Madingley Road, Cambridge CB3 0HE, UK
Largo Fermi 2, I-50125 Florence, Italy
Nuclear Physics Institute, Gatchina, SU-188 350 Leningrad, USSR
Department of Theoretical Physics, University of Lund, Sölvegatan 14A, S-22362 Lund, Sweden

Yuri Dokshitzer

"40 YEARS OF GLUON DYNAMICS "

4pm, Thursday December 1st
LPT Orsay