

General Information

- Location: Humboldt-Universität zu Berlin, Institut für Physik, AG Phänomenologie der Elementarteilchen, Newtonstr. 15, 12489 Berlin
- Started: 11/01/2008

Personal

- Group Leader**
 - Peter Uwer
- Ph.D. student**
 - Benedikt Biedermann
- Postdocs**
 - Kouhei Hasegawa
 - Philipp Kant
 - Ulrich Langenfeld
- Diploma students**
 - Ruth von Heusinger
 - Stefanie Hill

Recent Group Activities

- P.Uwer: Invited talk "Top quark theory", Hadron Collider Physics Symposium HCP2009, Evian 15-20 Nov 2009
- P. Uwer: Contribution to Startup-Workshop: Center of Computational Sciences Adlershof (CCSA), "Computational Aspects of Theoretical Particle Physics"
- P. Kant: Talk given at the 3rd Annual Workshop of the Helmholtz Alliance "Physics at the Terascale", DESY Hamburg, "Three-loop Corrections to the Mass of the Light Higgs Boson in the MSSM"
- U. Langenfeld: Talk given at the 3rd Annual Workshop of the Helmholtz Alliance "Physics at the Terascale", DESY Hamburg, "MSbar mass determination of the top quark"
- U. Langenfeld: Exercise, "alpha_s evolution", PDF School 2009, Hamburg, October 2009.
- P.Uwer: Invited talk, "Top quark pair production in association with an additional jet: Phenomenological results at next-to-leading order QCD", QCD2009, Berlin, October 2009.
- P.Uwer: Contribution to: Expedition ins Universum Wissenschaft, Tage der Forschung 2009, „Alles Quark oder was die Welt der kleinsten Teilchen“, September 2009
- P.Uwer: "Single-Top Workshop" DESY Hamburg, September 2009
- P.Uwer: Lecture on: "Monte Carlo Methods in High Energy Physics", Helmholtz International School - Workshop Calculations for Modern and Future Colliders", JINR, Dubna, Russia, July 2009.
- P.Uwer: CERN-TH-Institut: Top-quark physics, May/June 2009
- P.Uwer: Invited Talk: "Hadronic top quark pair production in association with a hard jet at next-to-leading order QCD" at DIS 2009, April 2009, Madrid
- P.Uwer: Lecture on: "Efficient Computing", DESY School CAPP: "Computer Algebra and Particle Physics", March 2009
- P.Uwer: CERN-TH-Institut: LHC2FC workshop (LHC for Future Colliders), February 2009

Collaboration in Networks

- DFG Sonderforschungsbereich SFB-TR9 "Computergestützte Theoretische Teilchenphysik"
- DFG Graduiertenkolleg GK1504 "Masse, Spektrum, Symmetrie"
- Subnode of HepTools, Marie Curie Training Network of the EU

Activities in the Alliance

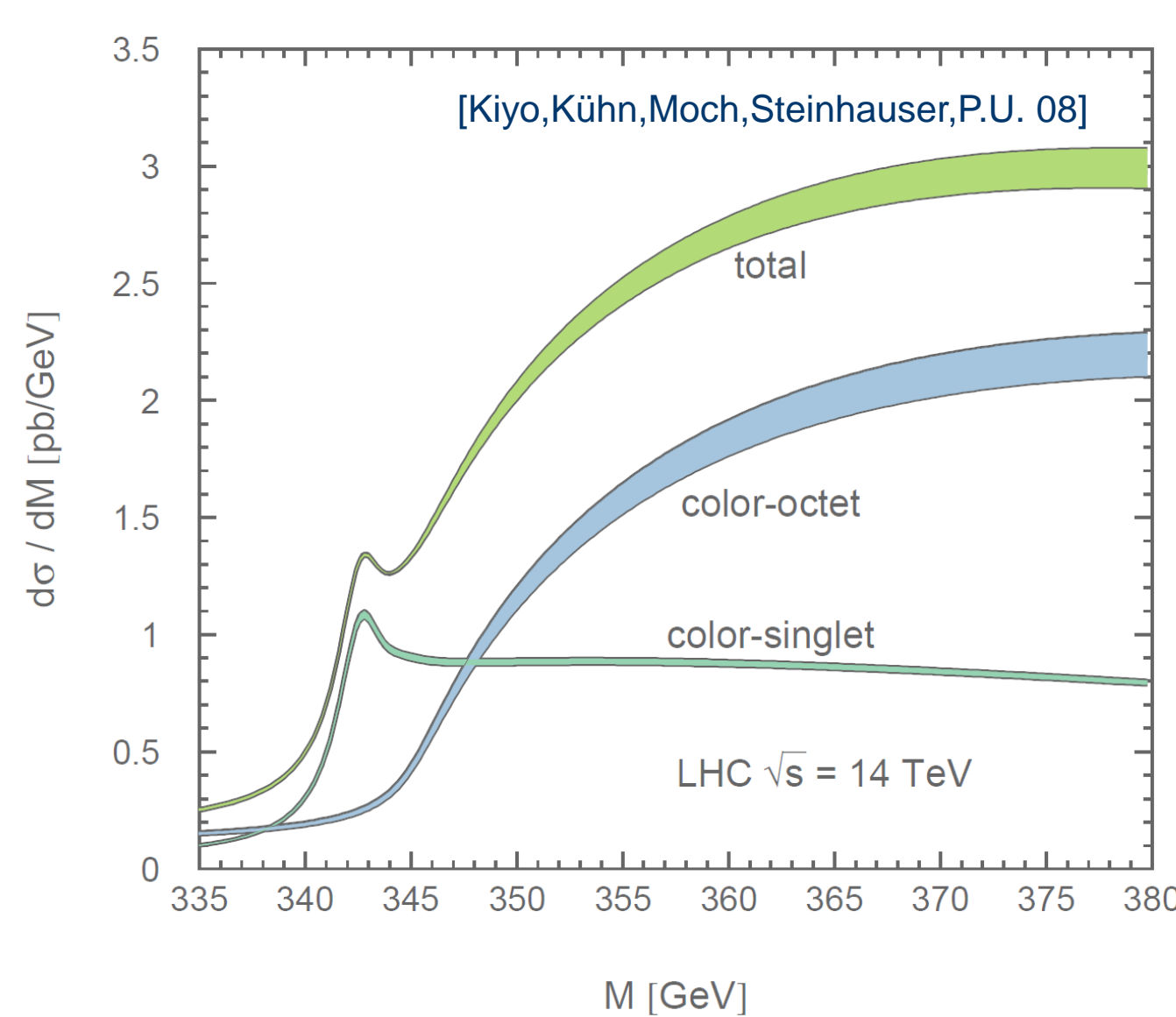
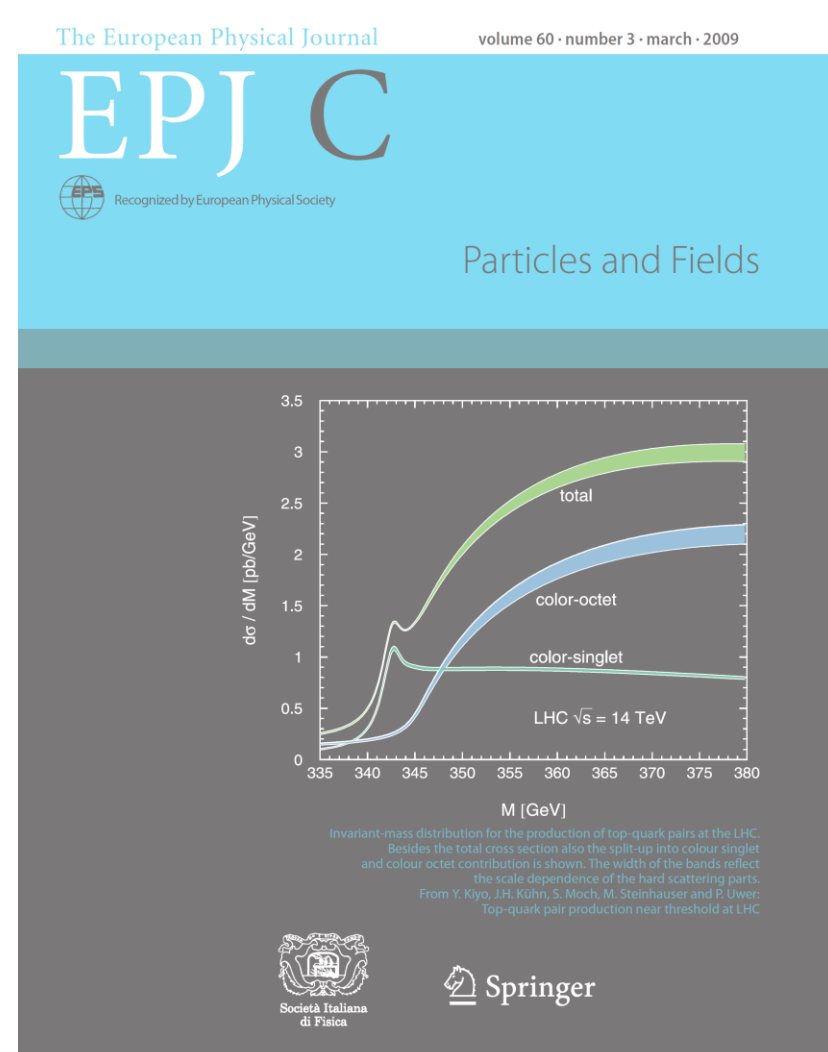
- Convener of the LHC-D-Alliance Top working group
- Contribution to CAPP school
- Research
 - first common projects emerging

Research Topics

- Radiative corrections for Tevatron, LHC and ILC
- Phenomenology of top-quarks
- Automation of one-loop corrections

Recent Scientific Results

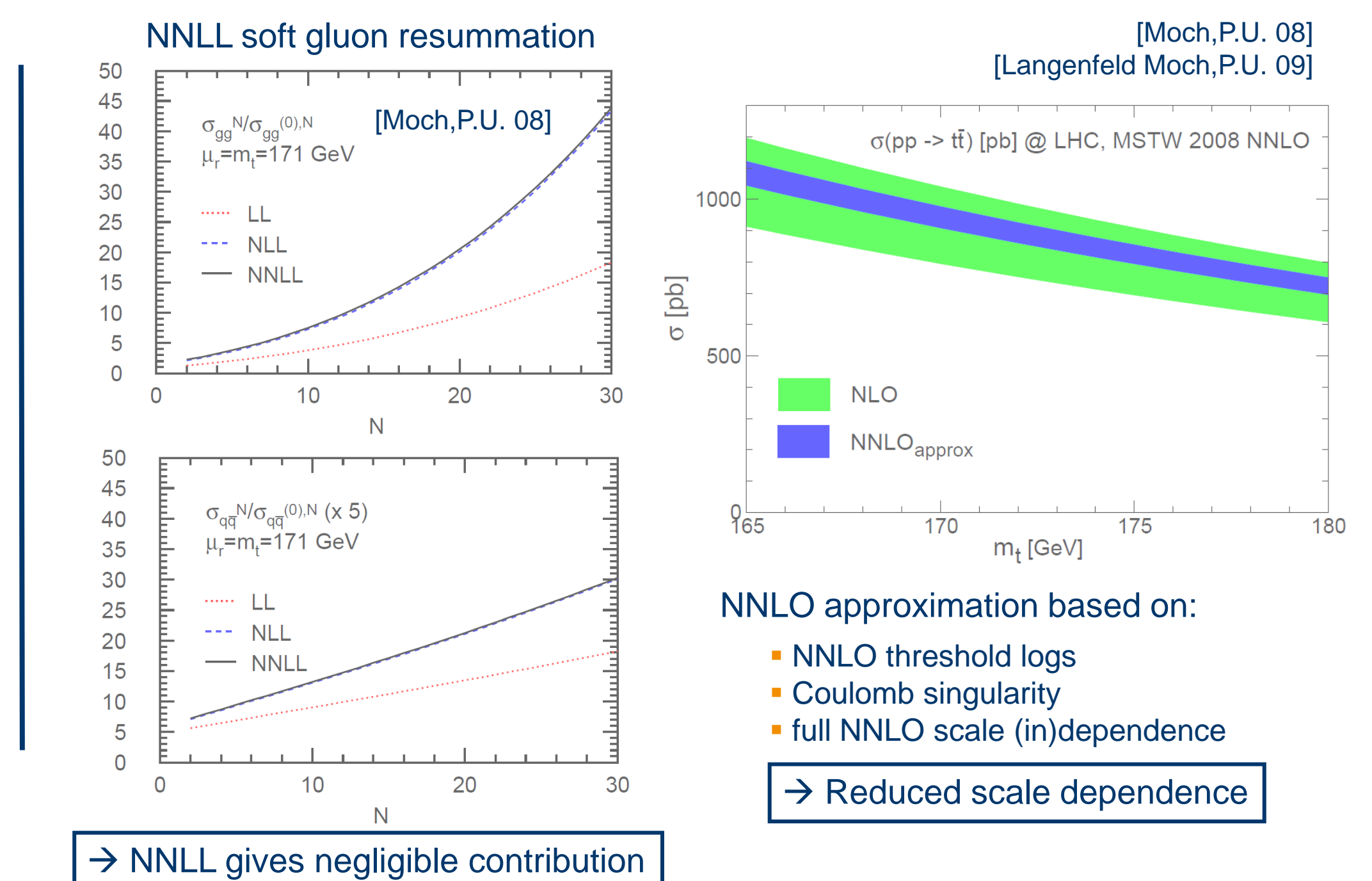
- Improved predictions for the inclusive top-quark pair production
 - Boundstate effects in top-quark pair production



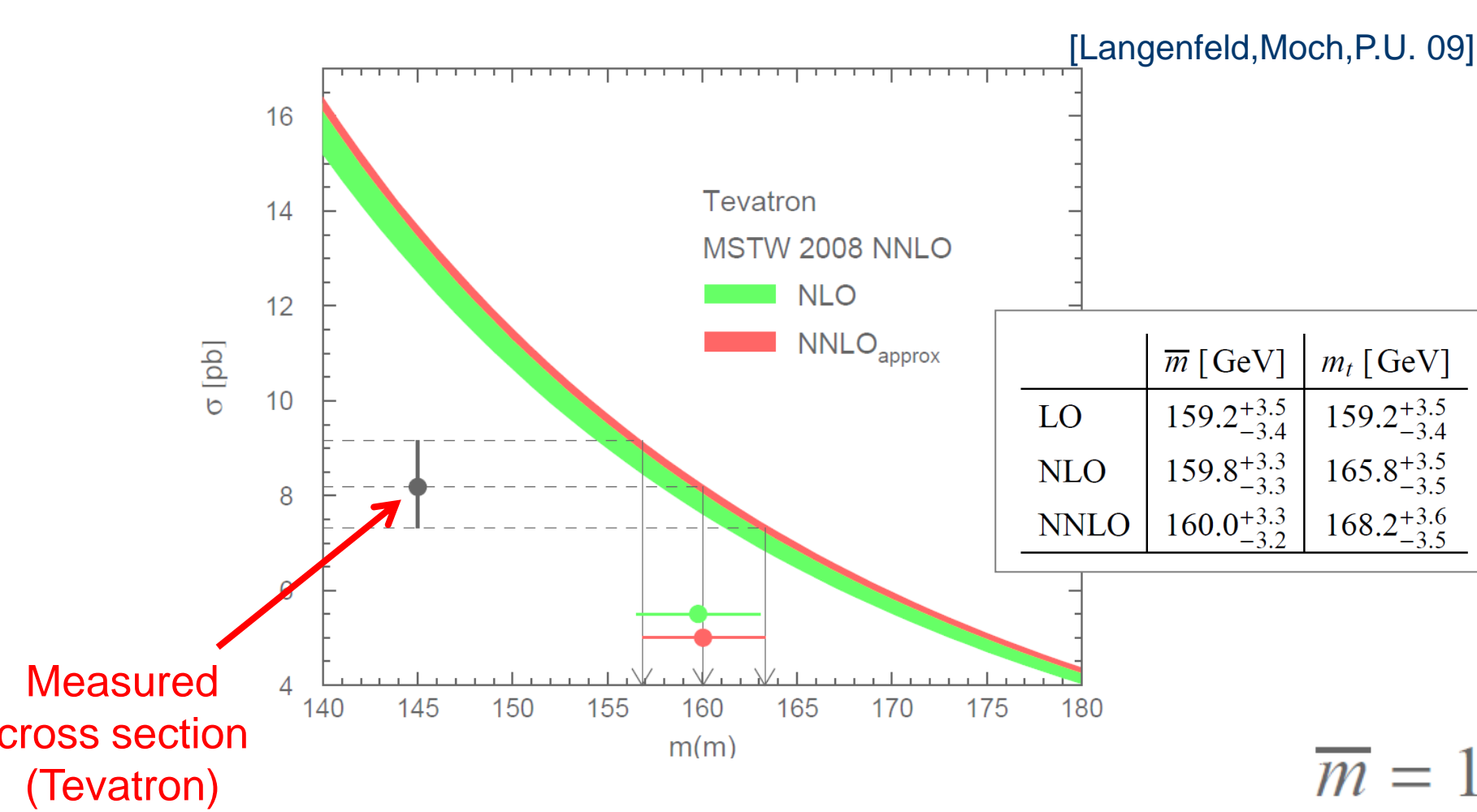
→ Boundstate effects modify invariant mass distribution in threshold region, resummation via non-relativistic Schrödinger-Greens function

→ Effect on the total cross section ~10 pb at LHC

- Approximation for the NNLO total cross section



- First direct determination of the running top-quark mass



→ On-shell / pole mass known to have intrinsic theoretical uncertainties of the order of Λ_{QCD}

→ Direct determination of the running mass, provides valuable cross check

- Automatic generation of Catani-Seymour subtraction terms

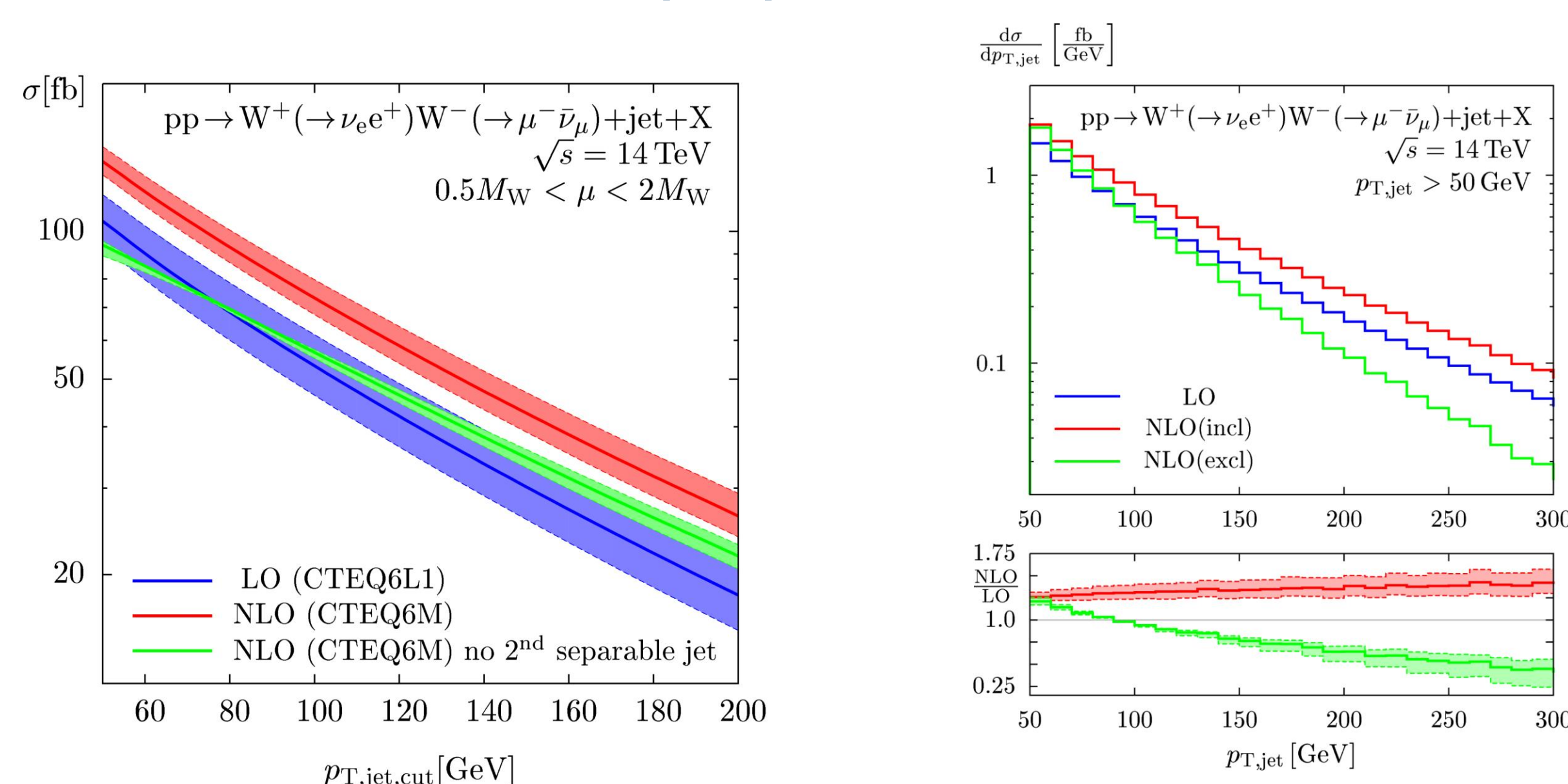
At NLO cross sections receives contributions from virtual as well as real corrections

Both are infrared divergent

Established method to extract singularities: Catani-Seymour dipole formalism

AutoDipole provides tool to calculate completely automated the required subtraction terms

- NLO corrections for W boson pair production in association with an additional jet



pp → W ⁺ W ⁻ + jet + X @ 14 TeV			
μ = μ _{ren} = μ _{fact}	σ _{LO} [pb]	σ _{NLO,excl} [pb]	σ _{NLO,incl} [pb]
0.5 M _W	27.17638 (89)	22.216 (15)	34.641 (14)
1 M _W	23.97398 (79)	22.606 (12)	31.970 (11)
2 M _W	21.26027 (70)	22.5646 (97)	29.7959 (89)

pp → W ⁺ (→ ν _e e ⁺)W ⁻ (→ μ ⁻ ν _μ) + jet + X @ 14 TeV			
μ = μ _{ren} = μ _{fact}	σ _{LO} [fb]	σ _{NLO,excl} [fb]	σ _{NLO,incl} [fb]
0.5 M _W	118.849 (11)	89.227 (99)	148.826 (68)
1 M _W	104.9482 (94)	93.789 (76)	138.808 (56)
2 M _W	93.1789 (83)	95.493 (60)	130.401 (57)

→ Important background process for Higgs search

→ Interesting signal process

Further Information

- For further information please visit: www.physik.hu-berlin.de/pep
- Or contact: Peter.Uwer@physik.hu-berlin.de