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Autore	Wang Jian
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Nota di contenuto	Supervisor's Foreword; Preface; Acknowledgments; Contents; 1 Introduction to the Standard Model of Particle Physics; 1.1 Particles; 1.2 The Electroweak Theory; 1.3 Quantum Chromodynamics; 1.4 Open Questions; References; 2 Foundations of the Quantum Chromodynamics; 2.1 Origin of QCD; 2.2 Lagrangian of QCD and Feynman Rules; 2.3 Renormalization; References; 3 QCD Perturbative Calculation of the Scattering Processes at Hadron Colliders; 3.1 Factorization; 3.2 Infrared Safety; 3.3 QCD High Order Effects; 3.4 Resummation Methods; 3.4.1 Traditional Resummation Method 3.4.2 Resummation with SCET References; 4 QCD NLO Prediction on the Dark Matter and Photon Associated Production at the LHC; 4.1 Introduction; 4.2 Effective Operators; 4.3 Relic Density; 4.4 DM and Photon Associated Production at the LHC; 4.4.1 LO Results; 4.4.2 NLO Results; 4.4.3 Numerical Results; 4.5 Backgrounds and Discovery Potential; 4.6 Conclusions and Comments; References; 5 Resummation Prediction on Top Quark Transverse Momentum Distribution at Large p_T ; 5.1 Introduction; 5.2 Analysis of Kinematics; 5.3 Factorization and Resummation Formalism

5.4 Hard, Soft, and Jet Functions at NLO 5.4.1 Hard Functions; 5.4.2 Soft Function; 5.4.3 Jet Function; 5.4.4 Scale Invariance; 5.4.5 Final RG Improved Differential Cross Section; 5.5 Numerical Results; 5.6 Conclusions and Comments; References; 6 Search for the Signal of Monotop Production at the Early LHC; 6.1 Introduction; 6.2 Experiment Constraints; 6.2.1 K^0 - \bar{K}^0 Mixing; 6.2.2 Z Hadronic Decay Branching Ratio; 6.2.3 Dijet Production at the LHC; 6.3 Signals and Backgrounds; 6.3.1 Hadronic Decay Mode; 6.3.2 Semileptonic Decay Mode; 6.4 Conclusions and Comments; References
7 Summary and Outlook Appendix A Phase Space Integration; Appendix B Calculation of the Soft Functions; Appendix C Anomalous Dimensions

Sommario/riassunto

This book mainly investigates the precision predictions on the signal of new physics at the Large Hadron Collider (LHC) in the perturbative Quantum Chromodynamics (QCD) scheme. The potential of the LHC to discover the signal of dark matter associated production with a photon is studied after including next-to-leading order QCD corrections. The factorization and resummation of t-channel top quark transverse momentum distribution in the standard model at both the Tevatron and the LHC with soft-collinear effective theory are presented. The potential of the early LHC to discover the signal of monotops is discussed. These examples illustrate the method of searching for new physics beyond what is known today with high precision.
