

Preface

The first physics conference I ever attended is the Workshop “QCD—20 Years Later” at the RWTH Aachen in June 1992. It took place between seminars I had to follow for my studies and the work for my diploma thesis. In both activities I successfully avoided topics too complicated to understand because of their close relation to the theory of the strong interaction i.e. quantum chromodynamics. Nevertheless, I found the concept of jets, presented by Bryan Webber at this workshop, quite intriguing and also the summary report on the strong coupling constant α_s , given by Guido Altarelli, seemed to be rather interesting. Two years later, encouraged by my thesis advisor Christoph Berger, I found myself venturing on a subject of pure QCD for my Ph.D. thesis: the determination of the strong coupling constant from jet measurements in deep-inelastic scattering with the H1 experiment at the HERA collider in Hamburg. However, I unfortunately could demonstrate that the theoretical calculation available to me at that time had severe shortcomings preventing a timely success of this initial Plan A. As a consequence and instigated by another talk from Bryan Webber, I dug even deeper into QCD for Plan B and analysed, this time successfully, the interplay of perturbative and nonperturbative aspects in the context of event shapes and power corrections.

Almost 20 years and two experiments later, my fascination for QCD and its successes has not ceased to increase. Thanks to the CMS experiment and numerous students confiding in me for their thesis work I was able to contribute to the more recent successes of QCD at the LHC. Meanwhile, I also had the great pleasure to lecture on experimental jet physics just after Bryan Webber in the Graduiertenkolleg of KCETA in 2014. Last autumn, I was also selected to present the results of CMS at a workshop dedicated to the strong coupling constant at future colliders—just before the distinguished summary speaker Guido Altarelli. Unfortunately, he passed away just some days before. The proceedings of this workshop are dedicated to his memory. I would have appreciated very much to have his expert opinion on the latest developments and somehow “close the loop”.

To share and conserve the knowledge gained during LHC Run 1, I find it timely to summarise my research and to write up the lectures that I have given since 2012

in the form of this book. I hope it proves to be a useful resource on the topic of QCD and jet physics for students and colleagues alike.

Knowing that it is practically impossible to name all who contributed in one or another way to this work, I would like to express my sincere thanks to everybody enabling me to pursue and accomplish my research goals. I offer my excuses to all those I cannot mention explicitly. First of all, I thank my colleagues in CMS for the opportunity to analyse the data of this great experiment. In particular, my thanks go to my long-term collaborators Günther Dissertori, Mikko Voutilainen, Nikos Varelas, Len Apanasevich, Andreas Hinzmann, Panos Kokkas, Manjit Kaur, Katerina Lipka, Ringaile Plačakyte, and Maxime Gouzevitch. Of course, there are also many colleagues in other experiments and projects or from theory, to which I am indebted, and I would like to mention explicitly my friends from FASTNLO Markus Wobisch and Daniel Britzger, my HERAFITTER/XFITTER collaborators, and Sergey Alekhin, Johannes Blümlein, Sven-Olaf Moch, Marco Guzzi, Stefan Dittmaier, Alexander Huss, Peter Uwer, Stefan Tapprogge, Frank Ellinghaus, Tancredi Carli, Steffen Schumann, Enrico Bothmann, Simon Plätzer, Juan Rojo, Pavel Nadolsky, and Gavin Salam.

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