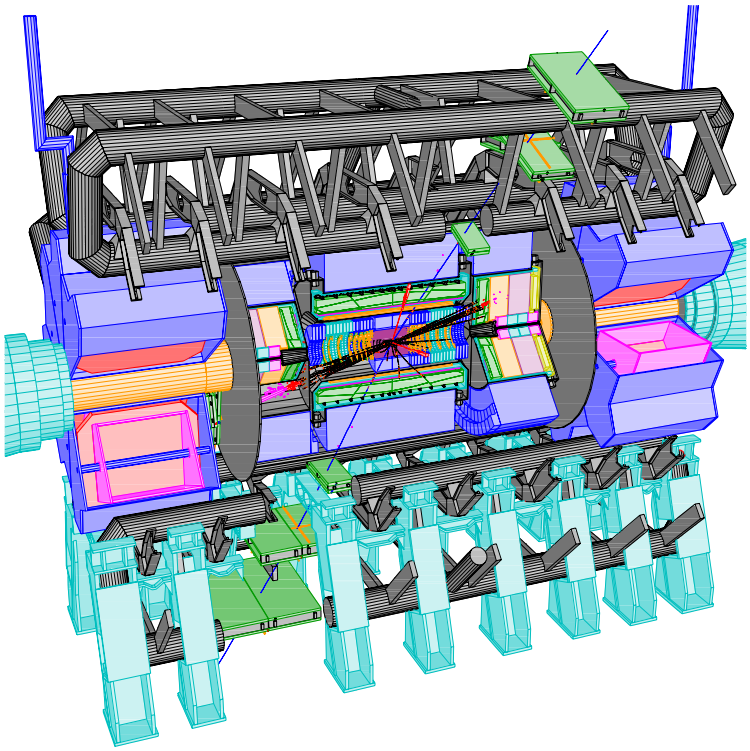
ATLAS DETECTOR AND PHYSICS PERFORMANCE



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Volume I

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Preface

The Large Hadron Collider opens a new frontier in particle physics due to its higher collision energy and luminosity compared to the existing accelerators. The guiding principle in optimising the ATLAS experiment has been maximising the discovery potential for new physics such as Higgs bosons and supersymmetric particles, while keeping the capability of high-accuracy measurements of known objects such as heavy quarks and gauge bosons.

The ATLAS subdetectors have been described in separate Technical Design Reports (TDRs), and the construction of the detector has begun. The purpose of this Detector and Physics Performance TDR is to document the expected overall physics performance of ATLAS. This TDR will serve both as a reference for the collaboration members and as an introduction to the ATLAS experiment and its rich physics potential for other physicists.

Volume I is dedicated to describing the detector performance. After a general overview in Chapter 1, and description of the simulation and reconstruction software in Chapter 2, each subsystem is described in a separate chapter with an emphasis on recent results: Inner Detector (Chapter 3), Electromagnetic Calorimeter (Chapter 4), Hadron Calorimeter (Chapter 5) and the Muon system (Chapter 6). Since physics analyses deal with objects reconstructed across many subdetectors, combined reconstruction is described in the following chapters: Electron / photon measurements (Chapter 7), Muon measurements (Chapter 8), Jet / hadron / $E_{\mathrm{T}}^{\mathrm{miss}}$ measurements (Chapter 9), and *b* tagging (Chapter 10). Finally, common issues vital for physics measurements are addressed: the ATLAS triggers are summarised in Chapter 11, the mass scale measurements in Chapter 12, and luminosity measurements in Chapter 13.

Volume II describes the physics potential of ATLAS. The theoretical and experimental framework is set in the Introduction in Chapter 14, after which the physics studies themselves are presented: QCD (Chapter 15), gauge bosons (Chapter 16), *B* final states (Chapter 17), top and other heavy quarks and leptons (Chapter 18), Higgs bosons (Chapter 19), Supersymmetry (Chapter 20), and other extensions of the Standard Model (Chapter 21).