

PREFACE

CMS Technical Design Report, Volume II: Physics Performance

To cite this article: Albert De Roeck 2007 *J. Phys. G: Nucl. Part. Phys.* **34** E01

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PREFACE

CMS Technical Design Report, Volume II: Physics Performance

The Large Hadron Collider (LHC) is expected to start operating at the European Particle Physics Laboratory, CERN, near Geneva, Switzerland, by the end of 2007. The LHC will collide two proton beams head-on with a total centre-of-mass system energy of 14 TeV and will thus offer a unique opportunity to study particle interactions at the TeV energy scale. The data that will be collected by experiments at the LHC are expected to be decisive in answering fundamental questions such as the origin of the electro-weak symmetry breaking in Nature. The most popular hypothesis to date is the existence of a Higgs field and an associated new type of particle, the Higgs boson, which is yet to be discovered. Furthermore, the LHC will break new ground in the quest for evidence of physics beyond the Standard Model of particle physics. New phenomena such as supersymmetry, extra dimensions, new gauge bosons, or new strongly interacting physics may well be within the reach of the LHC. Such new phenomena at the TeV scale are often required when taking into account all the cosmological and particle physics observations to date, and to stabilize the predictions of the Standard Model.

The CMS experiment is one of the two general purpose detectors designed for the search for new physics at the LHC. Together with ATLAS, CMS will study proton–proton collisions at the highest energies ever realized in the laboratory and sift through billions of events to find, at the start, a handful of unusual ones. However, these events may set the course of our understanding of space and matter for decades to come.

This special issue of *Journal of Physics G: Nuclear and Particle Physics* is dedicated to the publication of the second volume of the CMS Physics Technical Design Report. The first volume contains the detector performance capabilities and is available via the CMS web page: http://cmsdoc.cern.ch/cms/cpt/tdr/ptdr1_final_bw_full.pdf. This second volume covers the capability of the CMS experiment to address physics at the LHC, presenting a large number of physics analyses performed with very detailed simulations of signal and backgrounds, within today's approximations and modelling of these signals and backgrounds.

By publication of the CMS Physics Technical Design Report in *Journal of Physics G* we hope to offer to the wider physics community an in-depth view of the physics capabilities provided by this unique scientific instrument.

Albert De Roeck, *CERN, Switzerland*

for the Editorial Board of *Journal of Physics G: Nuclear and Particle Physics*

Please provide the following details when citing this Report:

CMS Collaboration 2007 CMS Technical Design Report, Volume II: Physics Performance
J. Phys. G: Nucl. Part. Phys. **34** 995–1579

or, in shorter format:

CMS Collaboration 2007 *J. Phys. G: Nucl. Part. Phys.* **34** 995–1579

The online version may be found at <http://stacks.iop.org/JPhysG/34/995>
or at <http://dx.doi.org/10.1088/0954-3899/34/6/S01>