ABSTRACT

Title of dissertation: Search for Pair Production of Third-Generation Scalar Leptoquarks and R-Parity Violating Stops in Proton-Proton Collisions at $\sqrt{s} = 8\,\text{TeV}$

Kevin Pedro, Doctor of Philosophy, 2014

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Search for Pair Production of Third-Generation Scalar Leptoquarks and R-Parity Violating Stops in Proton-Proton Collisions at $\sqrt{s} = 8\,\text{TeV}$

by

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Advisory Committee:
Professor Sarah C. Eno, Chair/Advisor

Dedication

To my parents, Philip and Lisa

Acknowledgments

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List of Abbreviations

ALICE	A Large Ion Collider Experiment
APD	Avalanche Photodiode
APV	Atomic Parity Violation
ATLAS	A Toroidal LHC ApparatuS
BPTX	Beam Pick-up Timing for the eXperiments
BRW	Buchmüller-Rückl-Wyler
BSM	Beyond Standard Model
CERN	European Organization for Nuclear Research
CL	Confidence Level
CMS	Compact Muon Solenoid
CMSSW	CMS Software
CP	Charge-Parity
CPU	Central Processing Unit
CSC	Cathode Strip Chamber
CTF	Combinatorial Track Finder
DAQ	Data Acquisition
DT	Drift Tube
EB	ECAL Barrel
ECAL	Electromagnetic Calorimeter
EE	ECAL Endcap
EM	Electromagnetic
FCNC	Flavor-Changing Neutral Current
FSR	Final-State Radiation
GSF	Gaussian Sum Filter
GUT	Grand Unified Theory
HB	HCAL Barrel
HCAL	Hadron Calorimeter
HE	HCAL Endcap
HEEP	High Energy Electron Pairs
HERA	Hadron-Electron Ring Accelerator
HF	HCAL Forward
HO	HCAL Outer
HPD	Hybrid Photodiode
HLT	High-Level Trigger
IP	Interaction Point
ISR	Initial-State Radiation
L1	Level 1
L1A	Level-1 Accept
LEP	Large Electron-Positron Collider

LHC	Large Hadron Collider
LHCb	Large Hadron Collider beauty
LQ	Leptoquark
LO	Leading Order
mBRW	minimal Buchmüller-Rückl-Wyler
MB	Muon Barrel
MC	Monte Carlo
ME	Muon Endcap
MET	Missing Transverse Energy
NLO	Next-to-Leading Order
NNLO	Next-to-Next-to-Leading Order
PD	Primary Dataset
PF	Particle Flow
PDF	Parton Distribution Function
PMT	Photomultiplier Tube
PS	Proton Synchrotron, Preshower
PSB	Proton Synchrotron Booster
QED	Quantum Electrodynamics
QCD	Quantum Chromodynamics
RBX	Readout BoX
RF	Radio Frequency
RMS	Root Mean Square
RPC	Resistive Plate Chamber
RPC	R-Parity Conserving
RPV	R-Parity Violating
SiPM	Silicon Photomultiplier
SLHA	SUSY Les Houches Accord
SM	Standard Model
SPS	Super Proton Synchrotron
SUSY	Supersymmetry
TCS	Trigger Control System
TEC	Tracker End Cap
TIB	Tracker Inner Barrel
TID	Tracker Inner Disks
TOB	Tracker Outer Barrel
TPG	Trigger Primitive Generator
TTC	Timing, Trigger and Control
VPT	Vacuum Phototriode
WLS	Wavelength-Shifting

Chapter 1: Introduction

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