

**Stony Brook University  
The Graduate School**

Doctoral Defense Announcement

**Abstract**

A Search for Second-generation Leptoquarks in  $pp$  Collisions

at  $\sqrt{s} = 7$  TeV with the ATLAS Detector

By

**Burton DeWilde**

Apparent similarities between the quark and lepton families of the Standard Model (SM) are, at the very least, suggestive of a more fundamental symmetry and interaction between them. In some Beyond the Standard Model theories, such interactions are mediated by leptoquarks (LQ): hypothetical color-triplet bosons with both lepton and baryon number and fractional electric charge.

The results of a search for pair production of second-generation scalar LQs are presented for a final state consisting of one muon, missing transverse energy, and at least two jets. The search is performed on  $1.03 \text{ fb}^{-1}$  of integrated luminosity of proton-proton collision data produced by the Large Hadron Collider at a center-of mass energy of 7 TeV and recorded by the ATLAS detector. Observed event yields in selected signal regions are found to be consistent with SM background expectations. Therefore, limits are set: LQs with mass  $m_{LQ} < 545$  GeV are excluded at 95% confidence level (CL), assuming the branching ratio of a LQ to a muon and a quark  $\text{BR}(LQ \rightarrow \mu q) = \beta = 0.5$ . When these results are combined with those of a complementary search in the  $\mu\mu jj$  final state, LQs with mass  $m_{LQ} < 594$  (685) GeV are excluded at 95% CL for  $\beta = 0.5$  (1.0). There are currently the world's most stringent limits on second-generation scalar LQ production.

**Date:** June 20, 2012

**Time:** 2:00pm

**Place:** Physics Bldg, D-122

**Program:** Physics

**Dissertation Advisor:** Dmitri Tsybychev