Search for Scalar Leptoquarks in T-Channel Production

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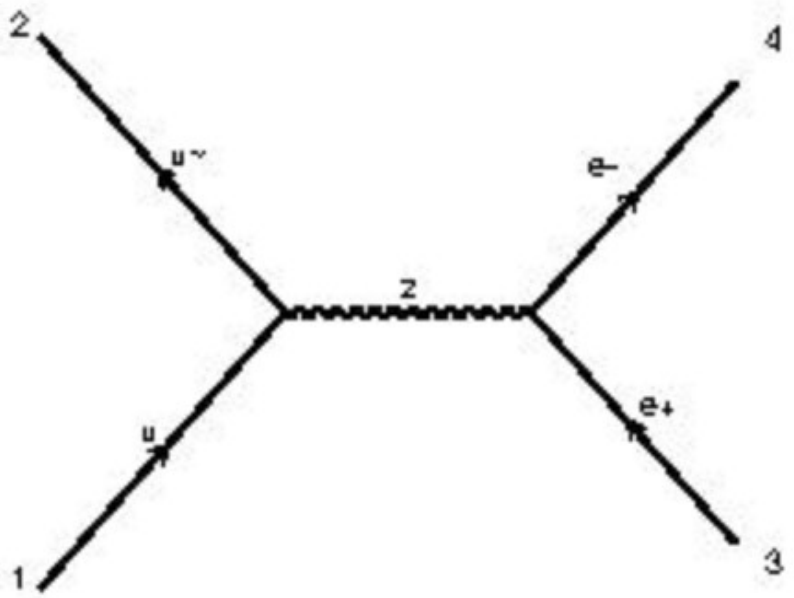
June 22, 2023

What are Scalar Leptoquarks (SLQ)?

- **Beyond Standard Model (BSM) particle carrying both a lepton number and baryon number**
- **Would couple directly to both quarks and leptons**
- **Recent resurgence in interest to resolve**
  - Possible violation of lepton number universality in B meson decays measured at ATLAS, CMS, and LHCb
  - The anomalous magnetic moment of the muon, measured at muon g-2 at Fermilab
- **Ongoing searches at ATLAS and CMS collaborations, and at LHCb**
- **Previous searches have focused on s-channel production, this study will focus on t-channel production of SLQs**

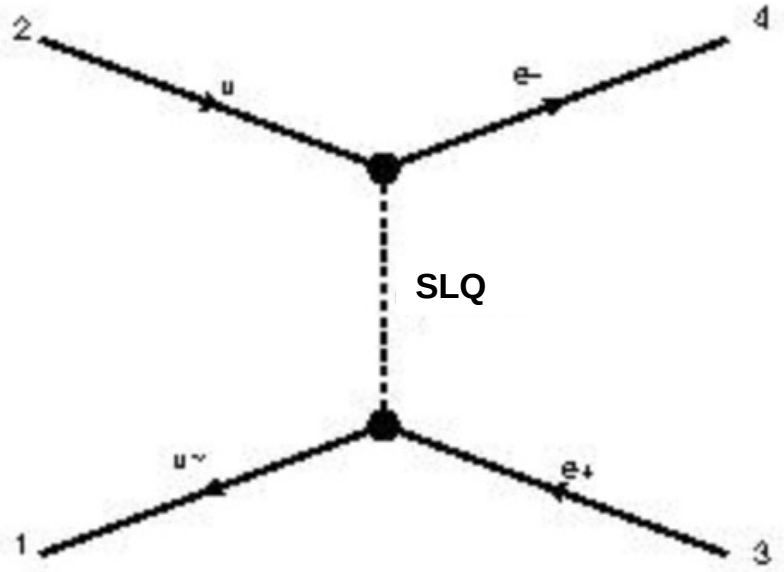
Drell-Yan Process Feynman Diagrams

S-Channel Production



Measures total center of mass energy of collision (timelike channel)

T-Channel Production



Measures momentum exchange between particles (spacelike channel)

Project Description and Goals

- Supervised by Conor Henderson, Nate Grieser
- Use MadGraph software to simulate Drell-Yan process in both the Standard Model, and Standard Model + Scalar Leptoquark model
- Use ROOT data analysis software to plot simulation results and look for differences between SM and SLQ predictions
- Find out how we can filter out non-SLQ events, like production of Z-bosons

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Progress Made

- Installed and learend how to use MadGraph simulation software
- Used MadGraph to make appropriate cuts and produce simulation results for Drell-Yan process for SM and SLQ model, at both 13 TeV and 13.6 TeV energies
- Installed and learning to use ROOT and ExRootAnalysis

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