

# Spinfest 2015

## Student Introduction

David Kapukchyan

# Background

- Born in Yerevan, Armenia
- Family moved to United States when I was two months old and we have been in California ever since.
- Always interested in the microscopic aspect about things like cells, atoms, etc.
- Got into physics when I found out there was a whole other world inside atoms and we can actually probe it.
- Goal is to better understand the quantum nature of things and find out what's up with gravity

# Other Interests

- Movies
- Video Games
- Programming and computers in general
- Etc.

# Education

- University of California Irvine (2008-2013)
  - B.S. Physics
    - Senior Thesis Project with Tim M.P. Tait
    - “Sensitivity of a future high energy  $e^+ e^-$  collider to  $Z'$  bosons” (Arxiv: 1312.3377)
  - B.S. Chemistry
- University of California Riverside
  - Started Graduate School in Fall 2014
  - Advisor: Kenneth Barish
    - Began working on Phenix Summer 2014

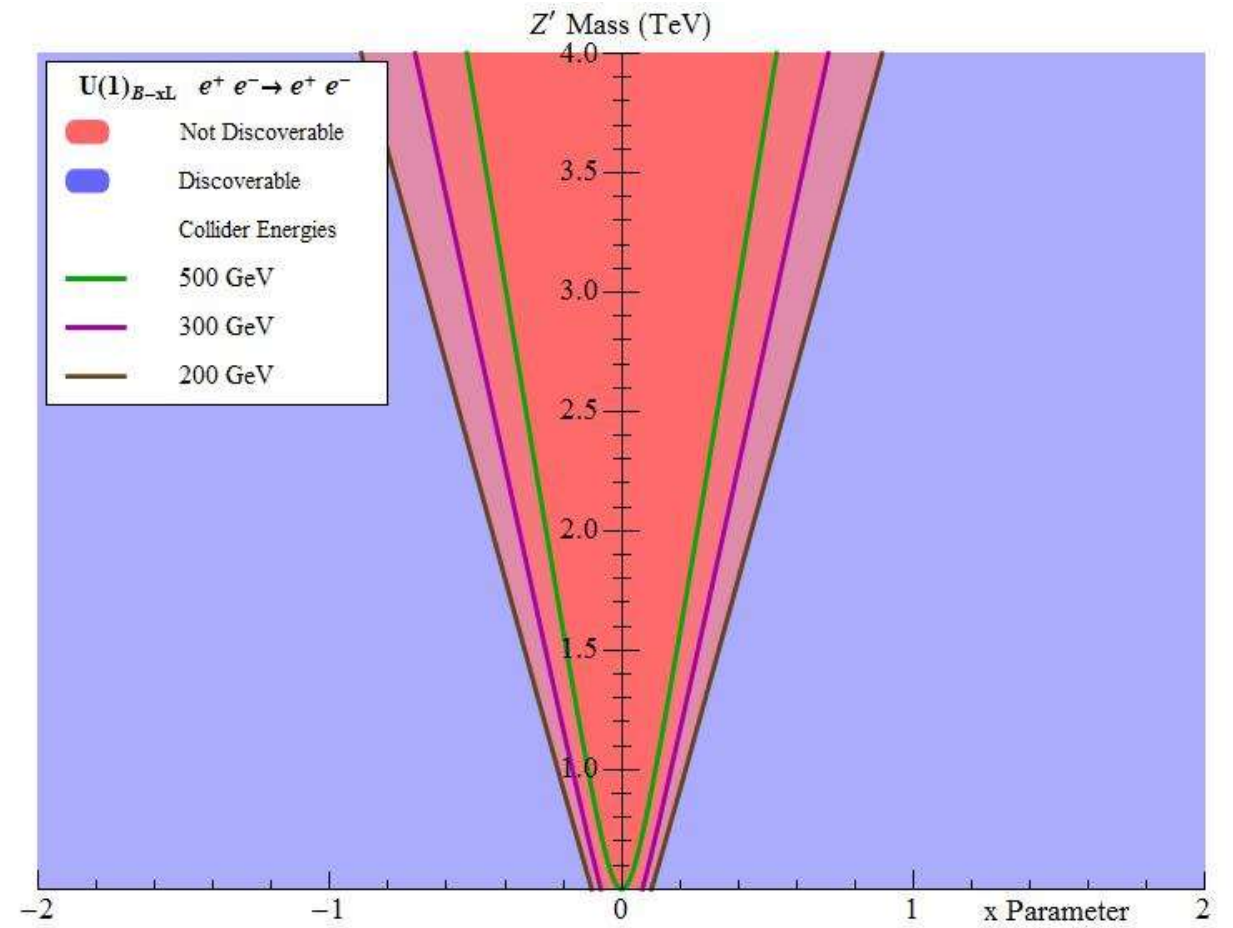
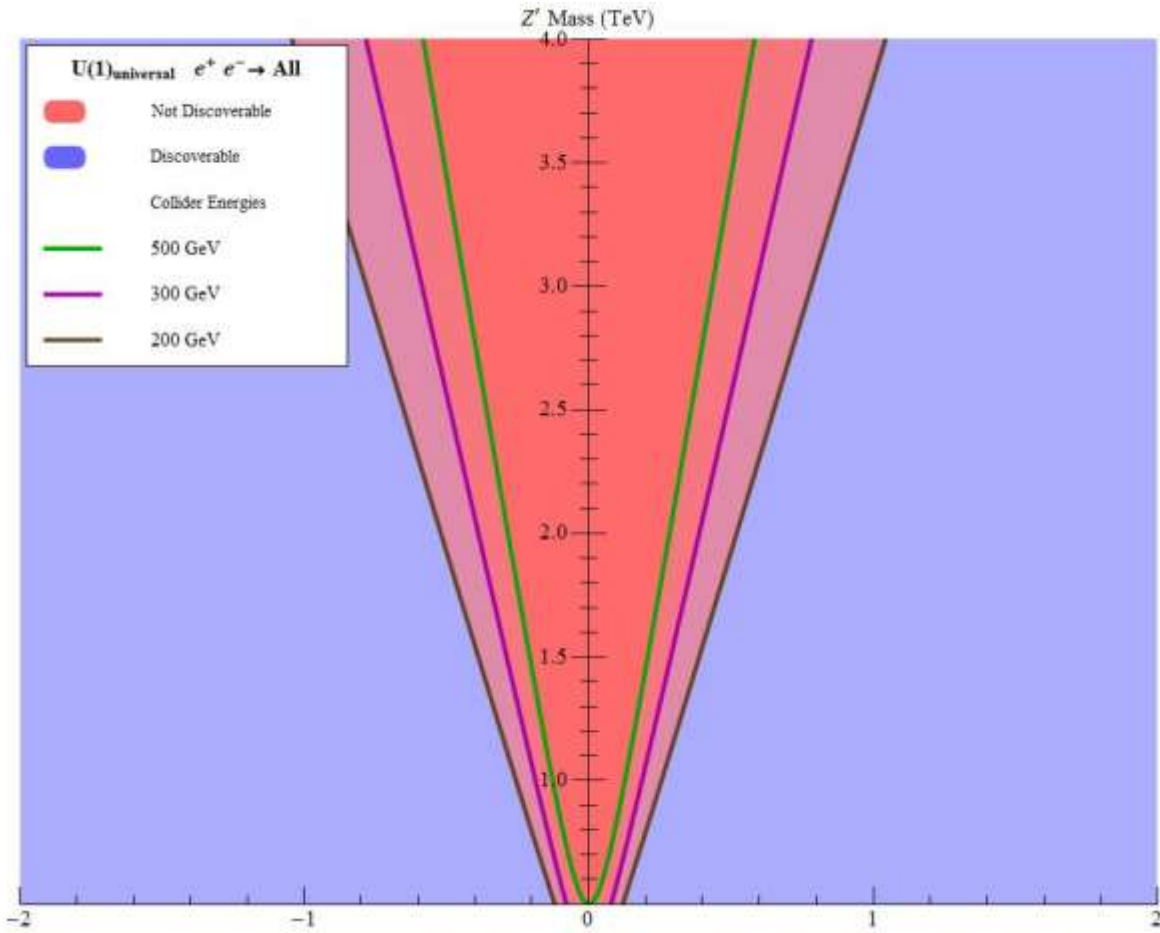
# Thesis

- Explored the limits of discovering a  $Z'$  boson
- $Z'$  boson treated as an extension to the Standard Model, specifically  $U(1)'$  gauge group
- Similar to Weak Interaction via  $Z$  boson but much heavier ( $>2.5$  TeV)
- Ran simulations with a virtual  $Z'$  interaction in an  $e^+ e^-$  collision at various energies and  $100 \text{ fb}^{-1}$  luminosity using MadGraph
- Four different models were considered and each coupled to  $e^-$  differently
- Cross sections of  $e^+ e^-$ ,  $\mu^+ \mu^-$ , jets, and bottom quarks were fitted to second order in coupling and mass based on the model considered

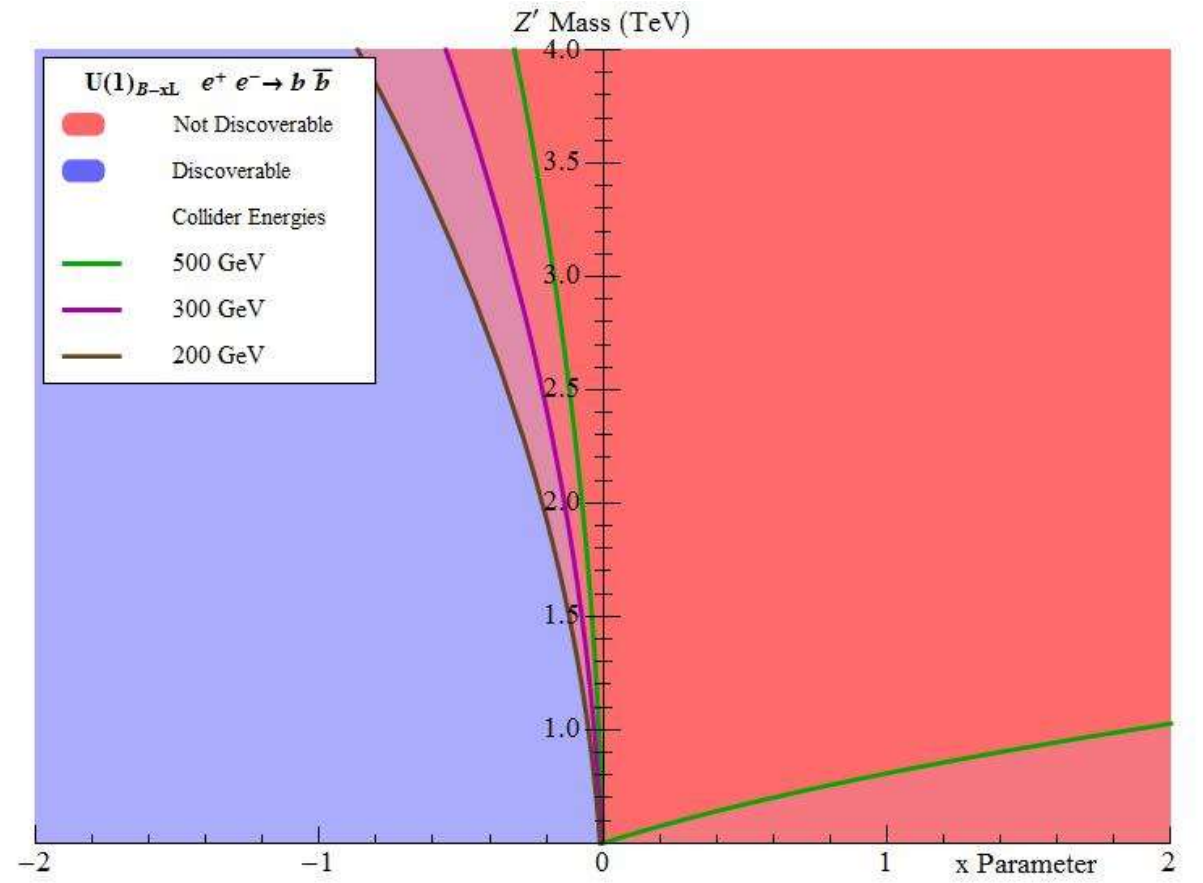
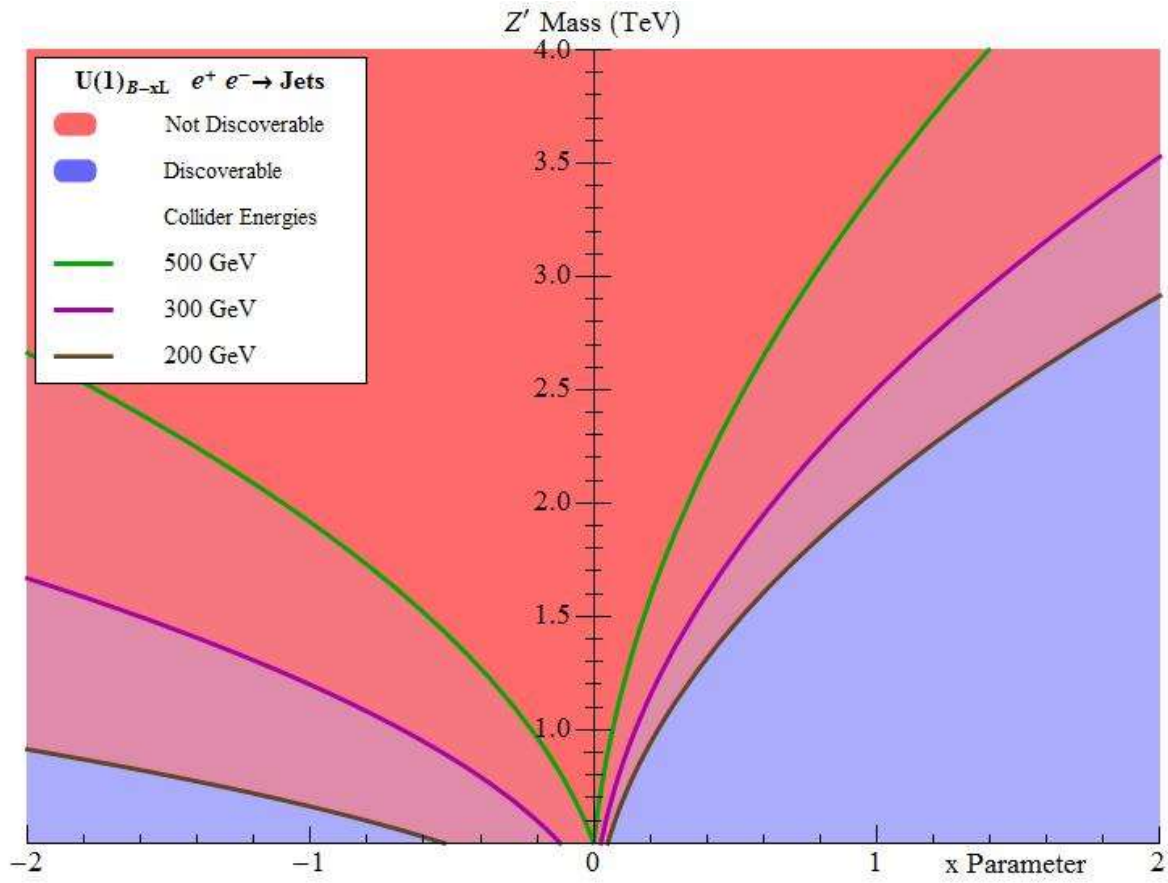
# Models Considered

Z' Model	$U(1)_{\text{universal}}$	$U(1)_{B-xL}$	$U(1)_{10+x\bar{5}}$	$U(1)_{10-xu}$
$g_{qL}$	x	1/3	1/3	0
$g_{uR}$	x	1/3	-1/3	-x/3
$g_{dR}$	x	1/3	-x/3	1/3
$g_{lL}$	x	x	x/3	(-1+x)/3
$g_{lR}$	x	x	-1/3	x/3

# Results

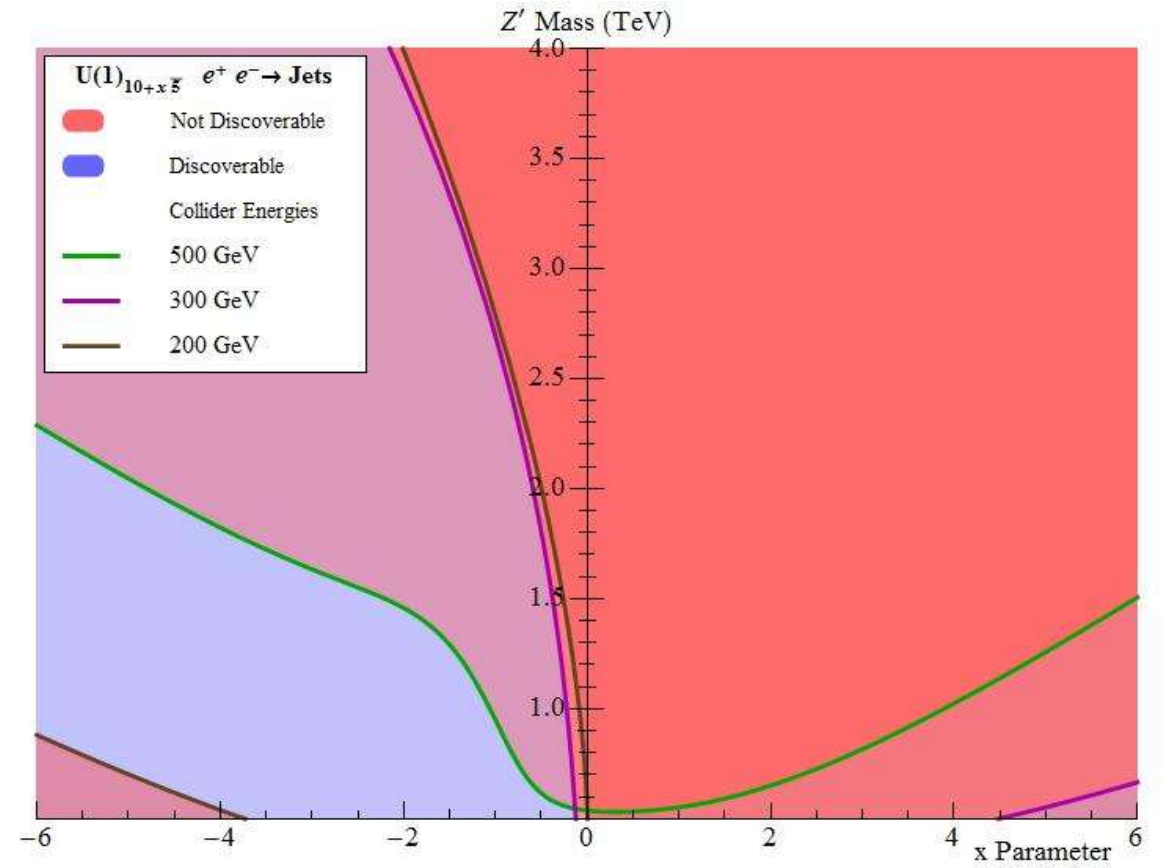
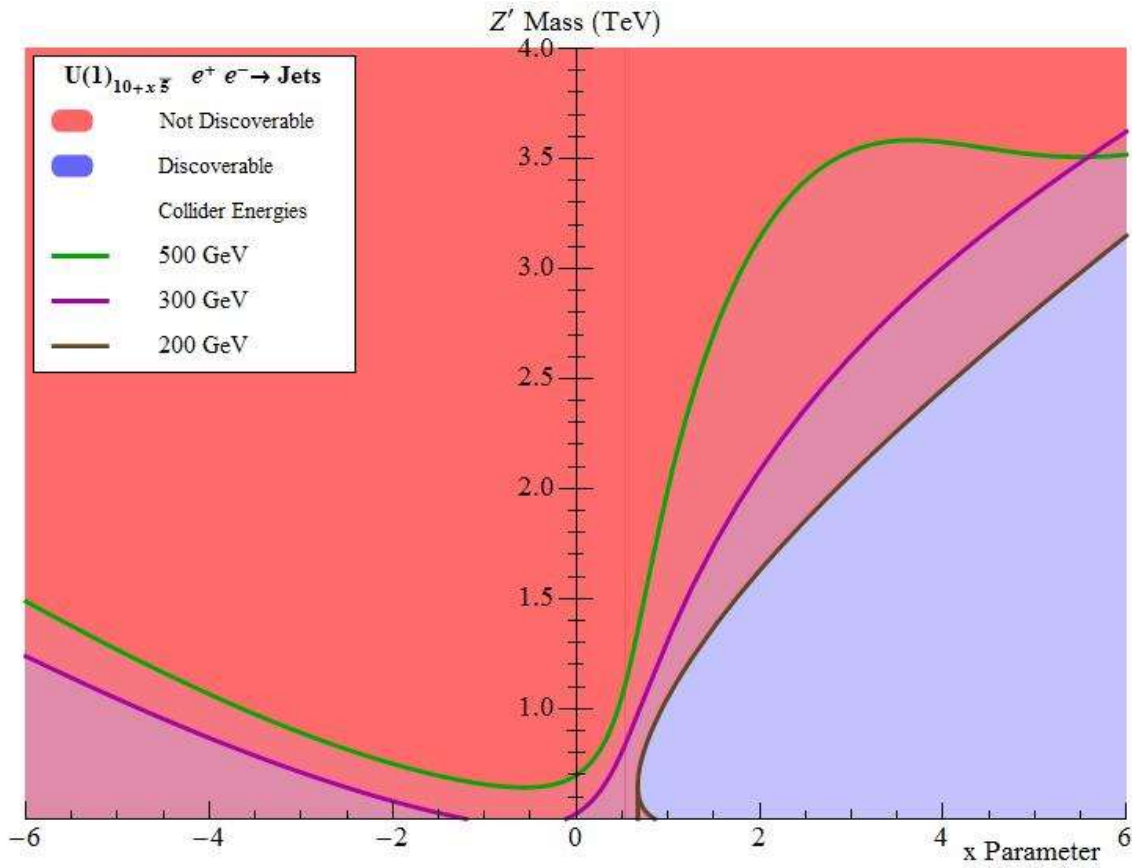


# More Results

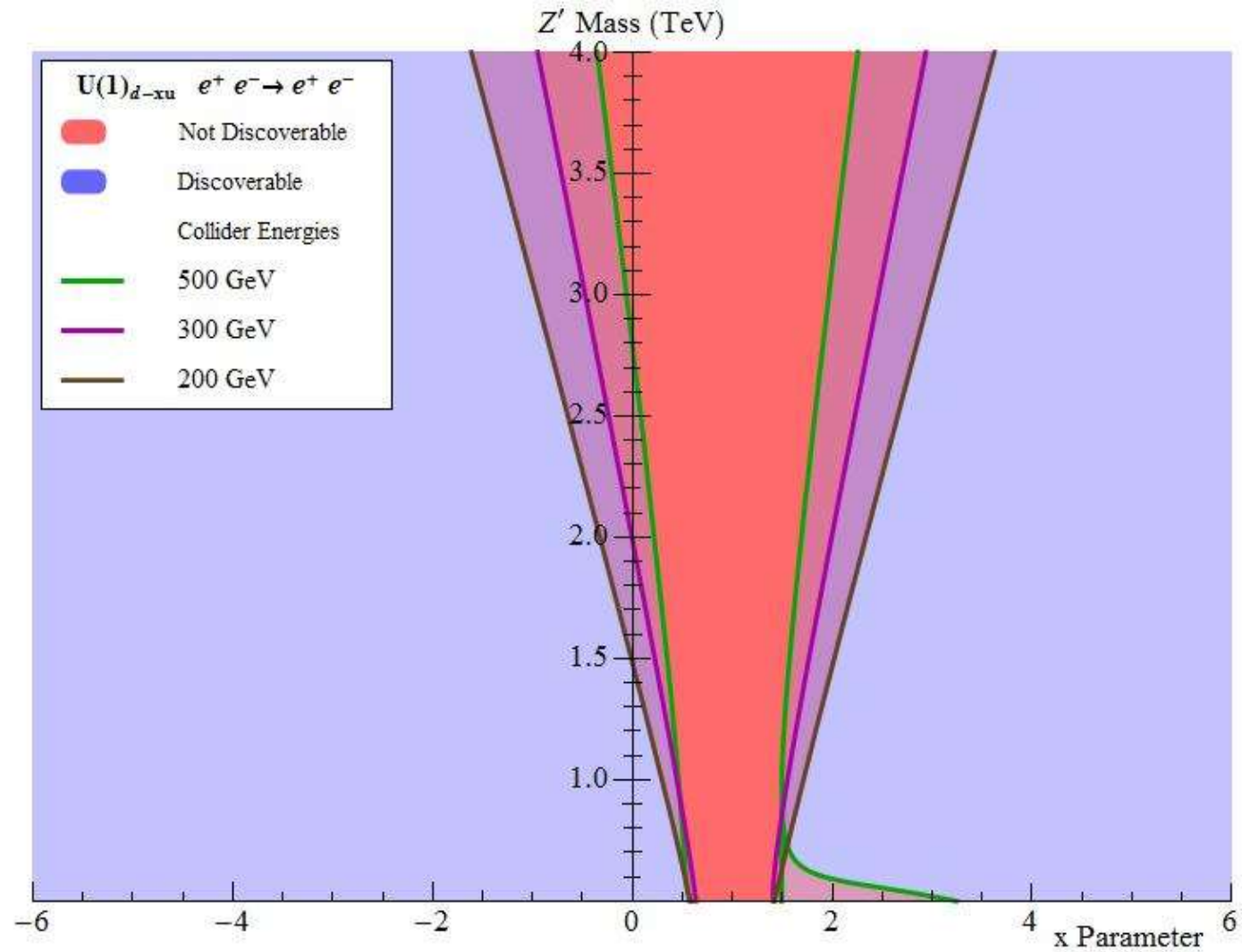




# Even More Results



# Last One



# Current and Future Work

- PHENIX collaboration at BNL
  - First shift at PHENIX was Run 15, 3/24-3/31
- Analysis of data from Run 15
  - Emphasis on MPC-EX and MPC to probe proton spin structure by looking at direct photons from pp (maybe p Au and p Al) collisions.
- Preparing for Comprehensive Exam in September 2015
- Classes
- Thesis?

# References

- “Sensitivity of a future high energy  $e^+ e^-$  collider to  $Z'$  bosons”  
Kapukchyan David, Tim M.P. Tait, J. Phys. G: Nucl. Part. Phys. 41  
(2014) 075011. (Arxiv: 1312.3377)