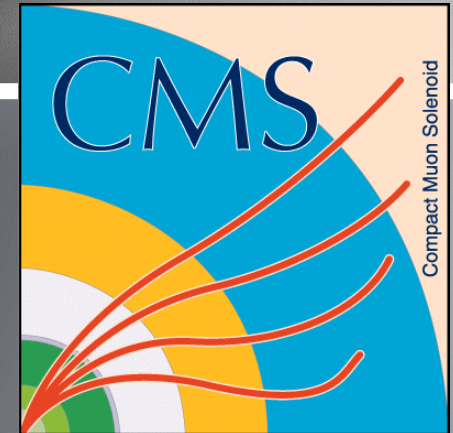


# Reconstruction of the Single Top

*By: Kelvin Mei (Rutgers University)*

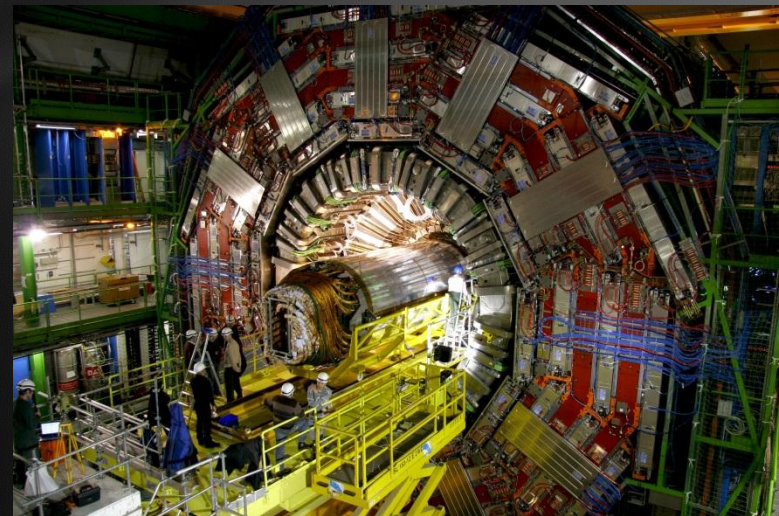
*Advisors: Konstantinos Kousouris*

*Andrea Giammanco*



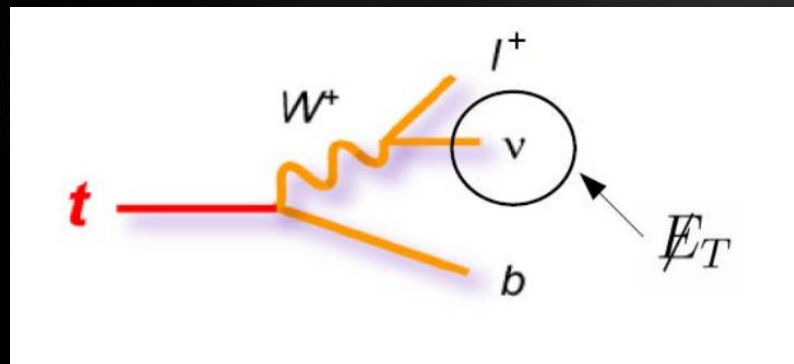
# CMS – Big Picture

- **General Purpose Experiment**
  - SUSY – Does this explain the unification of the electromagnetic, weak, and strong forces?
  - Higgs – Does this particle exist? Is the Standard Model accurate?
  - Dark Energy/Dark Matter – Why is the universe accelerating?
  - Extra Dimensions – Explain the weakness of gravity?
- **Reasons to Fund**
  - Research into technologies that revolutionize the world:
    - WWW (World Wide Web)
    - PET (Positron Emission Tomography)
    - Cancer treatments
    - Superconducting Coils
  - Search for Fundamental Truths
    - Why is the world the way it is?



# Reconstruction of Single Top

- Project: Using measurable variables such as missing transverse energy, lepton transverse momentum, etc..., reconstruct the single top from experimental data "with a maximal efficiency."
- Many difficulties ->
  - Transverse momentum of the neutrino is not detectable.
  - B-tagging uncertainties are large, thus making large error bars for the reconstructed  $t$ .
- Useful for:
  - Since the other  $t$ -decay channels are largely suppressed due to the configuration of the LHC (low correlation in the CKM matrix elements for the  $s$ -channel and decaying into down quark), this channel is a place to search for new physics.
  - The lower we can get the error bars and the uncertainties, the more sensitive this search will be.



# Wonders of Switzerland



ZERMATT



GENEVA

# Works Cited

Slide 1:

- CMS Logo: <http://www.physics.rutgers.edu/hex/>

Slide 2:

- CMS Detector: <http://cms.web.cern.ch/news/cms-particle-detector>

Slide 3:

- Feynman Diagram: D. Klingebiel. Prospects for a Measurement of the t-Channel Single Top Quark Cross Section with the CMS Experiment. April 2010.

Slide 4:

- All – Photographs By Kelvin Mei